International Council for the
Exploration of the Sea

C.M.1980/E:1
Administrative Report

MARINE ENVIRONMENTAL QUALITY COMMITTEE

by

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1979

Belgium

(W. Vyncke)

1. The effects of dumping industrial wastes off the Belgian coast on the stocks of fish, shrimps and other invertebrates were further studied.

   The monitoring programme was carried out every 2-3 months on two dumping areas for industrial wastes derived from the titanium dioxide production, one area for wastes from the production of thiocarbamates, one area for wastes from the production of proteolytec enzymes and one area for an industrial waste containing 1.5% phenol. A biological and physico-chemical survey was carried out.

2. The monitoring programmes on heavy metals in fish and shrimps were continued. Samples of cod, flounder, brown shrimps and mussels from the southern North Sea were analysed for Hg, Cu, Zn, Pb, Cd and Cr. The study on the evolution of mercury in Solea solea in the North Sea and the Irish Sea was continued.

3. Toxicity tests on phenolic wastes were carried out in accordance with the Oslo Convention.

4. A bimonthly biological and physico-chemical monitoring programme was continued on the northern part of Kwinte Bank, Buiten Ratel and Oostdyck Bank where sand extractions are taking place.

5. The regular monthly survey carried out to assess the general state of the marine environment was set forth in 1979. Samples were taken and experiments are performed in a 20 stations network (see report 1977).

   The following parameters were measured:

5.1 General oceanography: Temperature, salinity, plant pigments by fluorimetry and spectrophotometry, dissolved oxygen, suspended matter, turbidity (optical), light penetration (quantameter, Secchi disc), pH, meteorological observations.

5.2 Cycle of biogenous elements: Dissolved nutrients (NO_3^-, NH^+_4, PO_4^{---}, SiO_2) BOD_5, biomass and/or numbers and respiratory and/or uptake activities of phytoplankton, zooplankton, heterotrophic bacteria, benthic fauna, ichthyoplankton.

5.3 Cycle of pollutants: Heavy metals (Zn, Cd, Pb, Hg) and PCB, dissolved and particulate.

6. A grid of 80 stations (covering the same area as the regular survey network) was sampled on 5 occasions for hydrographical (T, S %) and biological parameters (chlorophyll, zooplankton). The main purpose of this programme is to gain an insight into zooplankton patchiness.

7. A more coastal network of 18 stations was covered on a few occasions. The programme concerns taxonomy, diversity of benthic fauna and their relationships to environmental factors.

8. Three coastal stations and two stations of the monthly survey grid were sampled monthly for faecal bacteria in water and sediments.

9. The diffusion of plaice eggs and larvae was followed between 8 January and 26 February on a triangular track extending to the middle of the Southern Bight of the North Sea.

10. Special cruises were organized to improve the knowledge of the distribution, the speciation and transformation rates of the organic matter present in the marine environment (bacterial uptake, stocks of small organic substrates and turnover times, phytoplanktonic excretion, etc ...). The isotopic composition of particulate organic N has deserved special attention with respect to the problem of terrigenous versus endogenous production.

11. The monitoring programme on the Scheldt has been continued. Regular monthly surveys were made at 36 stations in order to provide longitudinal profiles of physico-chemical parameters (salinity, temperature, dissolved oxygen, redox potential, pH, turbidity), to study sedimentation processes and heavy metal transport mechanisms, as well as nutrient interactions and bacterial activity.

12. Suspended matter sampled in the Western Scheldt was analysed for possible radiocontamination. This program covered three stations on three occasions.

Canada[1)]

(J. F. Uthe)

Resolutions passed at the 1978 Statutory meeting regarding research recommendations of interest to the Marine Environmental Quality Committee involve transport processes, newly identified marine pollutants and oil spill responses.

Resolutions passed at the 1979 Statutory meeting involved research into the biological effects, especially of ocean dumping in shallow and deep areas, intercalibrations and contaminant effects in marine mammals.

Items of research relevant to these resolutions are summarized below.

1. Gonyaulax toxins and zooplankton. Studies on algae of direct importance to shellfish and finfish fisheries continued, with emphasis on the fate of Gonyaulax toxins in the food chain and consequences to finfish. In brief summary, the rapid uptake of Gonyaulax toxins by each of several zooplankters has been demonstrated in grazing experiments performed in the laboratory. Furthermore, toxin retention by the zooplankters was shown for at least six days after ingestion of the dinoflagellates. The significance is that a variety of planktonic herbivores are capable of transferring Gonyaulax toxins to marine fish. This was supported during the summer of 1979 by a herring kill off Beaver Harbour, N.B., caused by Gonyaulax toxins which were, in this case, transmitted by the cladoceran Evadne normanni, unlike the 1976 Grand Manan herring kill in which pteropods were involved. (St. A.).

2. Cadmium uptake, excretion, and toxicity. A study of cadmium uptake and excretion by Macoma, a small marine bivalve was completed. Uptake and excretion of Cd presented as $CdCl_2$ and as CdEDTA were compared. In addition, the effect of Zn on the uptake of Cd was investigated to complete previous studies on the effect of the chelating agent (EDTA) and Zn and Cd uptake by Nereis and Pandalus. Macoma exposed for 2 weeks to 50 ppb Cd as $CdCl_2$, to 50 ppb Cd as CdEDTA, and to 50 ppb Cd with 500 ppb Zn as $ZnCl_2$ accumulated 8.2, 4.8, and 6.7 µgCd/g dry weight, respectively. Approximately 25% of the accumulated Cd was excreted within 4 weeks. The rate of uptake of Cd by Macoma is inversely related to animal size. The toxicities of $CdCl_2$ and CdEDTA and of $CuCl_2$ and CuEDTA in water were determined for several invertebrates. The CdEDTA complex was less toxic than $CdCl_2$ to Crangon and Macoma but did not affect the Cd lethality to Pandalus. The CuEDTA complex was less toxic than $CuCl_2$ to Crangon and Nereis but did not affect the Cu lethality to Macoma. (St.A.)

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1) There is some information from Canada in the Administrative Report to the Shellfish Committee which may be of interest to the members of the Marine Environmental Quality Committee.

3. Polycyclic aromatic hydrocarbons (PAH's). High levels of polycyclic aromatic hydrocarbons (many of these are known carcinogens) in muscle and digestive gland of lobsters, expecially those held for a time in impoundments that had utilized creosote-treated wood in their construction are of concern and their significance needs assessment. The Halifax component developed the expertise to determine individual PAH's. A review document relating the environmental and foodstuff occurrence of PAH's with the dangers posed for man has been prepared. A number of lobsters and shellfish have been analyzed. Levels of PAH's in digestive gland are about 10 times higher than those in tail muscle. Animals from areas contaminated by crude oil, from impoundments utilizing creosote timbers or from downstream of industrialized areas (Miramichi) have higher levels of PAH's than control or offshore animals. PAH's in lobsters appear to have a pattern characteristic of the source (background, creosote, crude oil). Animals with high PAH levels are not necessarily tainted. The rate of uptake of PAH's under winter conditions in a creosoted pound is being studied. Recently, as a sideline, it was demonstrated that sealing of Pyrex ampoules with solvent-based samples results in the formation of relatively large amounts of PAH although there was no apparent direct contact of the flame and solvent vapors. (Hfx.)

4. PCB's. The adsorption and desorption of Aroclor 1254 from sediments of different particle size ranges, organic carbon content, and at salinities from 0 to 28 o/oo were determined. (St.A.)

5. Phthalates. A number of in vitro experiments have been carried out with di-(2-ethylhexyl)phthalate and a steroid hormone metabolizing system. Metabolites of di-(2-ethylhexyl)phthalate have also been evaluated. Live cod have been collected, acclimatized and sexed. Dosage of encapsulated di-(2-ethylhexyl)phthalate has begun to determine the effects of this compound on steroid hormone metabolism and reproduction. A method for the determination of common phthalate esters based on a cleanup on acid-alumina and alumina followed by gas chromatography with electron capture detection has been developed. Only dibutyl and di-(2-ethylhexyl)phthalates have been found in a study of commercial species. Dibutyl phthalate was present at µg/kg wet weight levels while di-(2-ethylhexyl)phthalate levels ranged as high as 10 mg/kg wet weight. A major unknown phthalate present in a number of marine specimens is currently being investigated. It is likely a diester of phthalic acid but the nature of the alcohol groups remains to be established. (Hfx.)

6. Alkylphenols. Two different batches of nonylphenol were compared by HPLC (Eastman and Rohm & Haas). No difference was found. A liquid-liquid partitioning extraction for nonylphenol from water using spectral grade hexane was developed after XAD-2 failed to give satisfactory results. An XAD-2 resin extraction procedure was developed for nonylphenol and several other alkylphenols. A storage test was performed on the alkylphenols and it was found that glass adsorption could account for up to 30% of the losses observed. Gas chromatography was superior to HPLC for separation of alkylphenols. Salmon parr were exposed for 96 h to p-nonylphenol, p-hexylphenol,

p-sec-butylphenol and p-dodecylphenol in separate tests. Uptake was followed for 96 h and excretion for a further 96 h. GPC cleanup conditions for the fish tissues differed for individual alkylphenols. The p-dodecylphenol could not be completely cleaned up due to overlap of the lipid and p-dodecylphenol fractions. This necessitated discarding some of the phenol with the lipid and applying an appropriate correction factor to the final quantitation. (St.A)

7. Decabromodiphenyl Oxide (DBDPO). Analytical methodology was developed for this flame retardant in water and fish tissue. Subsequently the uptake and excretion of DBDPO, administered in water and in food, were investigated. Water analyses were completed in 1979, but analysis of fish is continuing into 1980. (St.A)

8. Dechloranes. These compounds are flame retardants for polymers and there is little information on their environmental properties. A study of their uptake and excretion from water and food by juvenile Atlantic salmon was completed. Mirex was used as a reference. Mirex and Dechlorane 602 are accumulated from water and from food. Dechloranes 603, 604, and Plus 25 are accumulated from food, but not from water. (St.A)

9. Aminocarb. Lethality studies with aminocarb, nonylphenol, Matacil formulation and diluent oil 585 with Crangon and freshwater mussel Anodonta supplement previously reported work done mainly with juvenile Atlantic salmon and confirm the conclusion that nonylphenol is not an "inert" ingredient of the formulation. Additional tests of the lethality of the pesticide diluent 585 (585 oil) showed that Mya and Nereis were not killed at average measured concentrations up to 0.28 mg/L during 96-h exposures and the 96-h LC50 for Pandalus was 0.01 mg/L (average measured concentration). Except for Pandalus, the 585 oil appears to be relatively nontoxic. Tests indicated the combined toxicity of aminocarb and fenitrothion to Crangon is additive. The uptake and excretion of aminocarb, nonylphenol and 585 oil by mussels (Mytilus edulis) was studied. Aminocarb, nonylphenol, and 585 oil reached maximum concentration in the mussels at about 2 days and declined slightly by 4 days. These compounds were not detected in the mussel tissue by 1 day post exposure, indicating rapid excretion. Calculated accumulation coefficients for aminocarb, nonylphenol, and 585 oil were 4.7, 9.9, and 153, respectively. Because of the low accumulation coefficients it was concluded that aminocarb and nonylphenol at water concentrations of less that 0.01 mg/L are not likely to result in significant contamination of bivalves. The 585 oil disappears rapidly from sea water (half life about 60 min), and significant accumulation seems unlikely. (St.A).

10. Pyrethroids. To further explore structure/lethality relationships, permethrin, cypermethrin and fenvalerate were tested for lethality to juvenile Atlantic salmon, lobsters and Crangon. Analyses of spiked salmon tissues indicated extraction efficiencies of 96, 73 and 55% for permethrin, cypermethrin and fenvalerate, respectively. Salmon exposed to sublethal levels of each of these compounds for 96 h had concentration factors of 70, 10, and 200 for

permethrin, cypermethrin and fenvalerate, respectively. Corresponding tissue concentrations were 500 ug/kg, 15 ug/kg, and 160 ug/kg. No pyrethroids were detected in lobsters or Crangon from the lethality tests. (St.A.)
The persistence of permethrin and decamethrin in sediments was measured using Crangon as the indicator organism. At intervals, Crangon were placed in beakers with 1.8 L of sea water and 200 g of sand spiked with 500 ppb permethrin or with 10 ppb decamethrin. Initially, Crangon died with 6 h but time to death increased to about 22 h for each compound when "aged" for 2 days. After 4 days' "aging" and a water change, permethrin was not lethal to Crangon and the time to death increased to 84 h in the decamethrin test. After 8 days "aging" and an additional water change, Crangon did not die in either test situation. This is an initial step towards development of a relatively simple bioassay technique to assess the relative persistence of a variety of organic contaminants in marine sediments and sea water. (St.A).

11. Sublethal effects. Development of methodologies for the determination of the pyridine nucleotide redox-potential and the adenylate energy charge is in progress. Enzymatic assay procedures with standard solutions (10-100 mole/mL) of pyridine nucleotides (NAD, NADH, NADP, NADPH) and adenine nucleotides (AMP, ADP, ATP) have been established. Preliminary indications are that these assay methods will be applicable for the analysis of tissue (liver) extracts from winter flounder. (St.A.)

12. Oil pollution from the KURDISTAN. From April to June components of Fisheries and Oceans studied the extent and impact of oil pollution, resulting from the Kurdistan breakup, on lobster and other fisheries on the eastern side of Cape Breton Island and the Nova Scotia mainland in areas where beach oiling has occurred. The degree of oiling was determined in both lobster and blue mussel. The samples originated from contaminated and control sites, and from laboratory experiments. The lobster analyses were carried out in conjunction with taste panel studies. Blue mussels were found to be better indicators of oil pollution than lobsters. A few clam samples were analyzed and, like mussels, were found to be better indicators of oil pollution than lobsters. Determination of eleven individual PAH's in lobsters showed markedly elevated levels in hepatopancreas as compared to control animals. Tail meat levels did not reflect such a marked difference suggesting oiling initially only affects the hepatopancreas. Cooking generally raises the level of PAH's within the tissue, presumably through dehydration. (Hfx.)

13. Miramichi dredging impact study. Studies have been initiated to determine the impact of the proposed Miramichi River, New Brunswick dredging project on shellfish fisheries in Miramichi Bay. Shellfish samples from selected areas have been analyzed for PAH's, cadmium, PCB's and histological integrity. The analyses will be repeated after dredging, scheduled to begin in the summer of 1980. Chemical analyses were carried out on site sample composites for oyster and lobster tissues while individual lobster hepatopancreas and tail muscle samples will be analyzed for cadmium and will be used to determine contaminant concentrations in the populations and changes over time. Levels of cadmium in hepatopancreas varied from 6.91 to 9.21 ug Cd/g wet weight (geometric means), PCB's from 1.42 to 1.86 ug/g wet weight and PAH's from 1 to 7.5 ug benzo(a)pyrene/kg wet weight and from 450 to 735 ug phenanthrene/kg wet weight. The PAH pattern from these lobsters was more similar to that found in offshore lobsters rather than the pattern found in animals associated with creosote usage. (Hfx.).

14. Chedabucto Bay Study. A "Mini-Mussel Watch" has begun within the Strait of Canso and Chedabucto Bay with mussels having been collected from a number of shoreline sites. Chemical analyses have been carried out on composites of 50 animals while histological investigations have been carried out on 10 individual animals from each site. Restraints will limit sampling to once a year in the pre-spawning spring period. Levels of PCB's, PAH's (pyrene equivalent), Ag, Cu, Hg, Fe, As, Mn, Se, Pb, Zn and Cd were determined. Only PCB levels were somewhat elevated in animals from the Strait of Canso sampling sites. PAH levels were found to be very dependent on the size of the mussels. Smaller (20-30 mm long axis) mussels had significantly higher PAH levels than larger animals (35-40 mm long axis). Histopathological studies did not find a high degree of abnormality in animals from any of the locations. Diffuse lipid droplets were identified in digestive glands from animals from a couple of sites but the pathological significance of this is unknown. (Hfx.)

15. Radioimmunoassay. A method for determining cortisol in fish plasma was developed based upon using antiserum to cortisol-21-succinyl-bovine serum albumin. This method is rapid, requiring only 100-300 µL of plasma, enabling studies to be carried out on live fish. Validation of the method was carried out utilizing the double isotope derivative assay (DIDA). This method will be utilized in studying the effects of long-term, low-level pollutants on fish. (Hfx.)

16. The sublethal effects of matacil and nonylphenol (used in spruce bud-worm spray) in vivo and in vitro were determined on the common brook trout (Salvelinus fontinalis). Both compounds did not appear to be very toxic to this species as far as effects on steroid hormone metabolism are concerned. The effects of nonylphenol were greater than those of matacil suggesting that the former is more toxic than the latter to this species (Hfx).

17. Areas in Atlantic Canada where fisheries resources (marine fish, sport fish and shellfish) have been adversely affected by media quality have been mapped and pollution sources affecting resources have been identified. Trends in media quality and resource utilizating have been examined and are described in a narrative accompanying the maps. The type of information which has been reviewed includes shellfish stocks which have been affected by bacterial contamination, inland fish species such as trout and salmon where migration or populations have been adversely affected by obstructions, pollution or other causes and incidents where the utilization of marine resources has been restricted by contaminants such as mercury and petroleum hydrocarbons. (EPS)

18. The Chemical Oceanography Division of the Atlantic Oceanographic Laboratory performs research related to the distribution and behaviour of trace metals, organohalogen compounds, petroleum hydrocarbons, nutrients and radionuclides in the marine environment. Areas of most intense study are the eastern Canadian Arctic, Baffin Bay, the estuary and Gulf of St. Lawrence and the Bay of Fundy. Particular attention has been paid during 1979 to examination of the organic components of marine sediments using GC/MS techniques, the geochronology of nearshore and continental slope sediments using natural and anthropogenic radionuclides, and measurements of the fluxes of metals through the nearshore zone. In addition the Division also conducts investigations of the flux of chemical components in atmospheric precipitation and the rates of carbon dioxide exchange between the ocean and atmosphere. (BIO)

19. Sampling of sediments and biota (fish, lobsters, shellfish) from 75 stations in Chaleur Bay, Canada, was successfully completed in August and September 1979. Selected samples will be analysed for four heavy metals (mercury, lead, arsenic, cadmium) and three classes of organic compounds (PCB's, chlorobenzenes, seven polycyclic aromatics) early in 1980. The objectives are to describe presence and levels of these materials in the Bay, especially in the sediments, and examine the data in relation to known site-specific sources of industrial and municipal pollution. (EPS).

20. Although almost half of the industries in the Canadian Atlantic Provinces emit wastes into estuarine and coastal marine waters the toxicity control on those industries that are regulated is conducted by testing effluents at the end-of-pipe locations, using the rainbow trout (Salmo gairdneri). A bibliography, revised from an earlier 1977 version, presents the literature on the ecology, physiology, biochemistry, genetics, culture, diseases, and toxicology of trout (S.g.), along with a KWIC (Key word in context) index and a chapter on the role of trout in toxicity testing. One of the uses of the bibliography will be to assess the suitability of using trout for controlling the discharge toxicities of wastes entering salt water; that is, some comparative toxicology between trout and endemic marine species will be possible from the use of this and other bibliographies, so that the level of protection afforded Canadian marine systems by this approach is carefully studied.(EPS).

21. Studies were completed on the acute lethal toxicities of an oil dispersant (Corexit 9527), an oil (No. 2B fuel oil), and dispersed oil (No. 2 fuel oil and Corexit 9527), working with fingerling rainbow trout and adult threespine stickleback (Gasterosteus aculeatus). Analysis of the results to date showed that the fuel oil was the major contributor to lethal toxicity of the mixture to both fish, and that all test solutions were more toxic to the sticklebacks than to the trout. These results, plus an evaluation of sticklebacks as a marine test organism, will be used to revise the toxicity criteria in the Canadian oil dispersant 'acceptability' guidelines. (EPS).

22. A major report has been prepared on the topic of oil spills and dispersant use in Canadian marine waters. It attempts to appraise: (1) the fate and effects of oil spilled in Canadian marine environments; and (2) the implications of using dispersants on spills. The review was initiated with the purpose of identifying gaps in understanding oil pollution. In particular, it was hoped that the report would provide a useful background on research priorities for dispersants, and on policy for their use. The report is presently in press.(EPS)

23. The abundance and regional distribution of Cu, Ni, Cr, and V in the St. Lawrence estuary and Gulf of St. Lawrence sediments has been determined. The data for Zn, Cu, Pb, Co, Ni, Cr, V, As, Ce, Hg, and Cd have been determined for the Bay of Fundy sediments. Analysis has been completed for 41 sediments from Baffin Bay, the coastal sediments of Baffin Island, and a few from the western coast of Greenland as well as the Sounds leading into the Arctic Ocean. The results indicate that the levels of heavy metals in the nearshore sediments are at or near natural levels, but the sediments from the deep parts of Baffin Bay contain above average levels of Mn, Co, Ni, Zn and Cu. (BIO)

24. During the past year, the potential bio-availability of heavy metals in the St. Lawrence estuary and the Gulf of St. Lawrence (Co, Ni, Cr, and V) has been determined and published. We have also completed the analysis for the potential bio-availability of the metals (Zn, Cu, Pb, Co, Ni, Cr, and V) in the Bay of Fundy and the Arctic sediments. The results of these studies, except those of the Arctic, are summarized in a contribution to an ICES Workshop on pollution of marine sediments to be held at Texel (Netherlands) in September. They indicate that 8 to 39% of the total Zn, 5 to 21% of the total Cu, 12 to 27% of the total Pb, 7 to 25% of the total Co, 7 to 29% of the total Ni, 1 to 11% of the total Cr, and 3 to 23% of the total V are potentially available to the biota. The outcome of this work may be applied elsewhere to detect the buildup of 'available' metallic constituents from anthropogenic sources and to set national limits for metals contained in material such as dredge spoils that are artifically introduced into estuarine and coastal environments. (BIO)

25. The objective of this project is to define the mechanism and extent of MFO induction in fish by foreign compounds, with a view to using this sub-lethal bioassay in 'effects monitoring' programmes. The dose-response relationship between PCB fed (the dose) and hepatic MFO induction (the response) in trout (used as a model) has now been defined. In another experiment, MFO induction in trout by Aroclor 1254 (a PCB) was compared with that by a PCB replacement material (MFS-4169L). The replacement was shown not to induce trout hepatic MFOs and therefore, in terms of this sub-lethal bioassay, to be more environmentally acceptable material than PCBs. Future work

on this subject will include: (a) an attempt to relate MFO induction in trout (which is an effect demonstrable at the enzyme level) to a whole organism response; specifically, have the biochemical changes reflected in MFO induction any impact on the animal's ability to mobilise body burdens of foreign compounds? (b) application of information about MFO induction derived from trout (used as a model) to marine fish, with the object of relating MFO activity in marine fish to stress by environmental contaminants; (c) possibly an examination of the sub-lethal effects of PCB replacements other than those mentioned above on MFO induction in fish. (BIO).

26. The objectives of this project are to examine the inhibition of ATPase (a key enzyme in osmoregulation) rather than MFO induction as the "bioassay". Work on this project has dealt with method development. We have defined optimum conditions for the assay in two tissues, trout gill (used as a reference material) and mackerel eggs. The latter was studied because of the significance of development of osmoregulation in the growing fish. It is now possible to detect ATPase activity in mg samples of tissue, and we have shown that it is inhibited by various organochlorine compounds in vitro. Future work will exmine the activity of ATPase in crab gill, and its susceptibility to organochlorines in vivo. Crab, has been chosen because some genera (Carcinus is one) are osmoregulators; any inhibition of ATPase activity by organochlorines (an enzymatic response) should be reflected in a whole organism response (inability to osmoregulate adequately). (BIO).

27. Three experiments were carried out in which MFO activity in the digestive gland of Mytilus exposed to crude oil was compared to that in a control group of animals. The results of the three experiments were mutually contradictory: in the first, the "experimentals" showed more MFO activity than the "controls"; in the second, the reverse was found, and in the third, there was no difference between the groups. This line of work has been abandoned. Some future work on Mytilus MFO activity is planned, using better defined tissues such as hemocytes; this will be carried out under the auspices of the Canada-Germany agreement. (BIO).

28. Preliminary work was done in France at the Centre Oceanologique de Bretagne in Brest (COB/CNEXO) with clams from non-oiled and oiled (AMOCO CADIZ) sediments, to determine possible alteration of Ca flux through tissue fluids under combined stress from osmotic and petroleum hydrocarbon sources. Results from this preliminary look at the potential of this approach were dubious at best. A different approach was indicated. (BIO).

29. This is part of a continuing interest in the metabolism of zenobiotic compounds in the marine foodchain. Results of measurements carried out on oiled birds and fish collected at the site of the AMOCO CADIZ spill have been published. A second series of experiments with trout, studying the induction pattern of the AHH-mechanism over time and with different oil-dosages, has been completed once. This work will be repeated this winter to elicit more detail. A third series of experiments, involving controlled induction of the AHH-mechanism in birds, is in the preliminary stages. We are having difficulty with this work in that, while in the laboratory the AHH-induction is fairly reliable and reproducible, in the field the results are highly variable. While not unexpected, this causes problems in interpreting data. This work is being carried out in collaboration with Dr. D. Peakall of CWS, Ottawa. (BIO).

30. Three trips have been made to the site of the supertanker AMOCO CADIZ spill during 1979, both for general survey as well as for sample collecting. As well, a number of longer-term projects were initiated with French colleagues. Studies include the following: long-term hydrocarbon transport within sandy beach sediments, movement of petroleum hydrocarbon in estuarine mudflats, bioavailability of residual petroleum hydrocarbons to marine burrowing organisms as a function of weathering, depuration of oiled clams, self-cleaning of high-energy shorelines, long-term degradative processes in oiled salt-marshes, and microbial activities relating to buried stranded oil. (BIO).

31. This work is an extension of stranded buried oil studies begun in 1973 with ARROW-oiled Nova Scotia beaches. Where the earlier studies focused on the migration of stranded oil back into the marine environment, the present work concerns the chemical compositional changes in this buried oil and the bioavailability of these hydrocarbons. Results to date indicate that buried oil undergoes slow but continuous alteration, with preferential degradation of the aliphatic components. Parallelling this there has occurred a simultaneous increase in hydrocarbon-utilizing bacteria in these oiled beach sands. Related work with movement of hydrocarbons through watertable pumping indicates that these altered oil residues migrate vertically through the sand column, with eventual long-term contamination of the underlying watertable. (BIO).

32. Under investigation was the possible link between changes in respiration in crab exposed to oils and the oxygen-carrying capacity of haemocyanin. It has been observed that radioactively labelled hydrocarbons were taken up rapidly and accumulated from seawater into the crab haemolymph. Although marked and repeated depression of respiration could be demonstrated in the presence of water-soluble fractions of crude oils, no changes in either the 0_2-binding capacity of haemocyanin or of molecular conformational alterations could be measured. (BIO).

33. At present we are investigating the mutagenic-carcinogenic aspects of AHH modified hydrocarbons. Under investigation are the mutagenic potential of various oils and their water-soluble components in the alga, Chlamydomonas reinhardtii, a relative of the marine plankton Chlamydomonas. To date the work has involved studying the mutagenic activity of these oils using various strains of bacteria, both with untreated and with activated (AHH-modified) oil preparations. Unactivated mutagenic potential in bacteria has been demonstrated with all oils (Bunker C, diesel fuel, crude oils, aqueous fractions), with greatest sensitivity shown by the base-pair mutants (AMES strains TA1535 and 100). Preliminary studies with unactivated algae (Chlamydomonas) has shown no mutagenic potential as measured by streptomycin-resistance reversal. (BIO).

34. This work involves studies of toxicology and lethality in the marine phytoplankton Momochrysis lutheri, and the predatory impact on it by marine zooplankton in response to a range of chemical contaminants (oils, aromatic hydrocarbons, PCB, DDT, metals). During the course of the work a new bioassay for sub-lethal toxicology has been developed, which uses the graded changes in flagellar swimming movements as a toxicological index. At present a study is being carried out into the mechanics of sub-lethal zenobiotic toxicology, using computer analysis of mortality curves. This work is nearing completion. The predation study is half-complete, requiring some final work in the spring of 1980. Changes in predation of phytoplankton due to zooplankton have been measured, and are thought due to heightened feeding activity in the zooplankton (predator) in the presence of low levels of contaminants. (BIO).

Denmark

(A. Nielsen)

The Marine Pollution Laboratory has continued the monitoring activities during 1979. Monthly collections of samples for determination of the concentrations of nutrients and trace metals in sea water have been accomplished at eight locations in the Belt Sea and the Sound, while samples for determination of the content of trace metals, PCB and DDT in flounder and sediments have been collected at one location in the Great Belt and one in the Sound.

A similar programme has been carried out at six locations in the eastern part of the North Sea in August 1979. At this occasion additional water samples were collected for determination of the concentrations of radionuclides in North Sea sea water.

Monitoring of radionuclides is carried through by Risø National Laboratory. Samples of sea water, benthic algae (Fucus vesiculosus) mussels (Mytilus edulis) and sediments are collected 2-3 times every year in the Kattegat, the Sound, the Western Baltic and the Great Belt.

In 1979 the National Food Institute started a new investigation of the content of trace metals in fish. The investigation is a follow-up of a similar investigation which the institute conducted in the period 1973-75. Flounders from 210 locations in the Kattegat, the Sound, the Western Baltic and the Belt Sea have been caught and will be analysed for the content of Hg, Pb, Cd, Cu, Zn, As, Se. The content of the same elements in plaice caught at 60 locations in the North Sea will also be determined.

Field experiments and laboratory studies have been carried through by the Marine Pollution Laboratory as first step towards the estabishment of a Mussel Watch system in Danish waters.

The Laboratory for Aquatic Pathobiology has continued the investigations of a possible interrelationship between organic pollution of sea water and the occurrence of fish diseases especially the ulcus syndrome.

Investigations on the productivity of Zostera marina have been carried through by the Fresh Water Biological Laboratory with a view to study the feasibility of using this orgnism as an indicator of changes in the nutrient balance in the marine ecosystem.

(Greenland (Denmark), Poul Johansen)

Monitoring studies at disposal site for tailings from a lead-zinc mine and mill in West Greenland continued including ringed seal, fish, mussels, seaweed, sea water and sediments. The level of lead, zinc, cadmium and copper is measured.

Baseline studies at a uranium deposit in Southwest Greenland are initiated. Level of lead, zinc, cadmium, beryllium, uranium, fluorine and others is measured in fish, shrimps, mussels, seawater and sediment. The baseline level of radioactivity is measured too. In the fiords around the deposit the Danish Hydraulic Institute has started hydrographic investigations.

The Commission of Scientific Research in Greenland has initiated environmental studies at a molybdenum deposit and a closed lead mine in East Greenland. The level of lead, zinc and cadmium is measured in seaweed, sediment and seawater.

Finland

(T. Melvasalo and P. Tulkki)

In Finland all marine pollution studies are directed to the Baltic Sea.

In the physical field a study of energy exchange between water and air is under way off a nuclear power plant in the archipelago of the Gulf of Finland. Current measurements off the power plant have continued. A mathematical model for describing water level changes and currents was completed last year. This model has then been used to predict waste water dispersal and to study water balance of the Baltic Sea. In addition, current measurements were made, also in the Tvärminne area (Gulf of Finland) and in the Kemi sea area (north part of the Bothnian Bay). Results will be summarized in 1980.

In the chemical field, determinations of heavy metals and chlorinated hydrocarbons in sediments, water and biota including seals were under way in many laboratories. Development and intercalibration of methods have continued.

Biological pollution studies mostly related to monitoring programmes have been performed including work on primary production, chlorophyll a, phytoplankton, zooplankton and macrozoobenthos. Various studies in the field of marine biology, microbiology and ecology have been carried out in coastal regions. Finland participated in the intercalibration of biological methods conducted by Baltic Sea countries.

Oil pollution studies were performed in the south-western archipelago after an oil accident, which happened in spring 1979. The effects of oil in the littoral zone were especially studied.

Monitoring in accordance with the international conventions has continued. The Finnish research vessel visited the stations of the Helsinki Convention once in the Baltic proper and 2-4 times in the Gulf of Bothnia and in the Gulf of Finland. In addition, bilateral monitoring with Sweden and the USSR has taken place in the Gulf of Bothnia and in the Gulf of Finland. Coastal waters have been intensively monitored by the water authorities. Measurements of oil content in water and biota have been included in the national programmes.

Studies on carbon cycle continued. They included work on microbiology, sedimentology and modelling and an inventory of studies yet needed to understand the carbon and oxygen cycles of the Baltic Sea.

Together with the USSR and Sweden, reports of waste water load into the Gulf of Bothnia and the Gulf of Finland were completed. To prepare more reliable and uniform input compilations for the whole Baltic Sea, a working group has been established by the Interim Commission of the Helsinki Convention.

Finland also participated in the assessment work initiated by the Interim Helsinki Commission (IC) and which was carried out as a joint IC/ICES project. The outcome gives an overall picture of the state of pollution of the Baltic Sea today.

A Finnish Soviet symposium on the pollution state of the Gulf of Finland was held in August 1979.

FRANCE

(C. Alzieu)

I - PROGRAMMES DE SURVEILLANCE

- Les contrôles systématiques de la contamination des organismes vivants par les polluants rémanents ont été intégrés en 1979 dans le cadre du Réseau National d'Observation de la qualité du milieu marin (R.N.O.), dont l'activité était jusque là consacrée à la surveillance des paramètres hydrobiologiques des eaux littorales. Cette extension du R.N.O. s'est traduite par la désignation de 50 sites de prélèvement choisis en fonction soit de leur degré d'exposition à la pollution (estuaires, zones industrielles et portuaires), soit de leur intérêt commercial (zones conchylicoles), soit de l'absence de toute source de pollution (zones témoins). Ces sites sont soumis à un échantillonnage trimestriel de coquillages (huîtres et moules) et semestriel de crustacés et poissons en vue de déterminer leur teneur en hydrocarbures , composés organochlorés rémanents (PCB, DDT, DDE, DDD), et métaux lourds (Hg, Pb, Cd, Cu, Zn).

- La surveillance de la contamination de la faune marine est complétée par des analyses de métaux lourds et composés organochlorés effectuées sur des prélèvements d'organes de mammifères échoués sur le littoral. Les échouages font à ce titre l'objet d'un recensement systématique effectué par des correspondants locaux qui fournissent les résultats de leurs observations à un organisme centralisateur.

- La radioactivité naturelle et artificielle des ressources biologiques marines est contrôlée à partir d'échantillons d'algues et coquillages prélevés sur la côte et de poissons provenant soit de captures effectuées lors des campagnes de pêches des navires océanographiques soit d'échantillonnages pratiqués sur les marchés. Les résultats font l'objet de publications trimestrielles de l'organisme responsable.

- Le suivi écologique des rejets de phosphogypse en estuaire a été poursuivi et complété par un contrôle des teneurs en fluor dans les tissus et le squelette de poissons benthiques.

- Les opérations de surveillance par télédétection des rejets en mer d'hydrocarbures ont fait apparaître une recrudescence des navires en infraction dans la Manche et le Pas-de-Calais.

II - ETUDES ET RECHERCHES

- L'étude entreprise en 1978, et visant à déterminer l'origine et l'évolution des formations de nécroses ulcératives chez certains poissons côtiers a été poursuivie en 1979 dans deux directions principales :

1 - cartographie des zones atteintes,

2 - examens anatomopathologiques et histochimiques des tissus nécrotiques.

- Des recherches préliminaires, coordonnées au niveau national, ont été entreprises en vue de déterminer les critères physico-chimiques et microbiologiques permettant de définir puis de normaliser un test de biodégradation des polluants en milieu marin.

- Pollution par les hydrocarbures

. Les études d'impact et le suivi écologique des zones affectées par l'échouage de l'AMOCO CADIZ se sont poursuivis et un colloque international a eu lieu sur ce sujet en novembre 1979 à Brest.

. La biodégradation en laboratoire de différents hydrocarbures, y compris des aromatiques, dans des conditions comparables à celles existant en milieu marin a été étudiée afin de connaître les conditions optimales et d'en tirer des enseignements sur la conduite à tenir dans la lutte contre les pollutions pétrolières en mer.

. Le "Centre de Documentation de Recherches et d'Expérimentation sur les pollutions accidentelles des eaux" chargé de coordonner depuis 1978 les activités de prévention et de lutte contre les pollutions accidentelles par les hydrocarbures s'est essentiellement consacrée à :

- l'étude des conditions de dispersion des hydrocarbures dans le milieu,
- l'inventaire et le perfectionnement des moyens de lutte et de confinement des nappes,
- l'organisation de l'emploi des moyens existants pour le confinement, la dispersion, la collecte, le nettoyage et le stockage des déchets pétroliers,
- la mise à jour de l'inventaire des zones où l'emploi des produits dispersants est prohibé.

En relation avec la prévention des accidents, des exercices de remorquage et d'allégement de gros pétroliers ont été effectués.

- Thermoécologie : études "in-vitro"

Les effets du transit du plancton dans les centrales nucléaires ont été étudiés en laboratoire en vue de mettre en évidence des perturbations sur le développement de crustacés planctoniques et d'algues unicellulaires soumis à un choc thermique en milieu chloré ou non.

Germany, Federal Republic of

Monitoring

Seawater

The monitoring program which has been started in 1973 was continued in 1979. Analyses of seawater samples and particulate matter from stations in the German Bight were carried out for heavy metals. In the Western Baltic seawater was analyzed from stations for pesticides, PCBs, petroleum hydrocarbons, oxygen, pH and nutrients (Deutsches Hydrographisches Institut, Hamburg).

Monitoring petroleum hydrocarbons, pesticides and heavy metals was done on one central station (Forschungsplattform "Nordsee") in the German Bight. The area for dumping wastes from TiO_2 production was monitored for its pH-value during a cruise on RV "Gauss" (Deutsches Hydrographisches Institut, Hamburg).

The Cs 137 and Sr 90 content and partly that of Ru 106 and some transuranic isotopes has been determined in water samples of the Western Baltic taken at 47 stations in the region between the Flensburger Förde and $13^{o}30'E$ as well as in the Kattegat up to $58^{o}N$. Water samples taken monthly from on board of two light vessels within the German Bight were analyzed for their content of Cs 137 and Sr 90. At a network of about 145 stations covering the whole North Sea region water samples were taken for the investigation of their content of different artificial radioisotopes (Deutsches Hydrographisches Institut, Hamburg).

Sediments and suspended matter originating from the German Bight region have been analyzed on some sedimentological parameters and their content of ten different heavy metals (Deutsches Hydrographisches Institut, Hamburg).

Marine Chemistry

Neutron activation analysis was applied to the measurement of noxious trace elements in sea water. The formation of acute lack of oxygen in the Western Baltic was investigated. Research was performed on remote sensing of pollution by airplane and satellites in the German Bight, and on satellite remote sensing of mass concentrations of blue-green algae in the Western Baltic (Deutsches Hydrographisches Institut, Hamburg).
A research cruise with RV "Meteor" to the Norwegian, Greenland and Barents Seas was made to obtain background levels for pesticides, petroleum hydrocarbons and heavy metals. In the western part of the central North Sea a research cruise with RV "Gauss" was undertaken to study the influence of the plume of incineration vessels on the pH value of the seawater while operated with chemical refuse with high organic chlorine content (Deutsches Hydrographisches Institut, Hamburg).
Abundance and distribution of petroleum hydrocarbons was investigated in different areas of the Baltic. Development of methods for identification and quantification of petroleum hydrocarbons in sea water absorbed on particles and in biological material was continued. Oxygen and heavy metals budget of the Kiel Bight were investigated. Heavy metals in sea water from different areas of the Baltic were analyzed. Accumulation and transformation of heavy metals in sediments was investigated. Distribution of chlorinated hydrocarbons was analyzed in different areas of the Baltic especially in the Kiel Bight.
Investigations on adsorption and desorption of heavy metal compounds from surface layers were continued (Institut für Meereskunde, Kiel).

Projects on identification and quantitative analyses of organohalogen compounds in marine sediments and in sea water of the North Sea and selected estuaries were continued (Institut für Meeresforschung, Bremerhaven).

Residues in marine organisms

Residues of heavy metals, organochlorine compounds and hydrocarbons were analyzed in a variety of marine organisms from the North Sea and Baltic and from selected estuaries (Institut für Meereskunde, Kiel; Bundesforschungsanstalt für Fischerei, Hamburg; Institut für Meeresforschung, Bremerhaven; Staatliches Veterinäruntersuchungsamt,Cuxhaven). Regression analyses of heavy metal residue concentrations in statistically sampled populations of fish was continued (Bundesforschungsanstalt für Fischerei, Hamburg).

Effects of pollutants on marine organisms
Field studies

Investigation of variation of dynamics and productivity of macro zoobenthos populations were continued in dumping areas of the German Bight (Institut für Meeresforschung, Bremerhaven). Epedemiological studies on diseases of fishes in these dumping areas were continued (Bundesforschungsanstalt für Fischerei, Hamburg).
The trend analysis on heavy metals in mussels along the German coast started in 1973 was continued.
The trend analysis in macro zoobenthos populations in the sewage sludge dumping area was continued.
Trace element contents in Mytilus, Nereis, and Arenicola were studied in comparison to sediments (multielement analyses).
Specific experiments were conducted in the Kiel Bight to analyze the influence of a sewage treatment plant, and in the Wadden sea to analyze the influence of tidal exposure on bioaccumulation of metals and metalloids (Institut für Hydrobiologie und Fischereiwissenschaft, Hamburg).

In situ studies on effects of oil on Wadden sea ecosystems were continued (Institut für Meeresforschung, Bremerhaven). Possible correlations between concentrations of pesticides, PCBs and heavy metals in the gonads of Baltic herring and the mortality and percentage of hatch of their offspring were investigated (Biologische Anstalt Helgoland, Hamburg).

Other pollutants, microorganisms, plankton and benthic ecosystems

The influence of waste water discharge on activity and composition of micro flora in coastal areas of the Baltic, the effect of thermo pollution on microorganisms (bacteria and phytoplankton) in brackish water areas (Kiel Bight) were investigated (Institut für Meereskunde, Kiel). Investigations were continued on the effects of general stress factors on benthic ecosystems (Institut für Meereskunde, Kiel) and on purification capacity of marine algae (Institut für Meereskunde, Kiel).

Laboratory investigations

Heavy metals

Toxicity and accumulation of lead and cadmium by marine bacteria in continuous culture systems were investigated (Institut für Meeresforschung, Bremerhaven). Accumulation of organochlorines by lower fungi using Hexadecane as a model was investigated (Institut für Meeresforschung, Kiel). Laboratory investigations were conducted on the toxicity of different types of metalliferous sludges and of eluates from sludges as well as of mixtures from different organic pollutants on marine hydroids. Accumulation and metabolism of arsenic were studied in experiments with algae and Mytilus edulis (Institut für Fischereibiologie und Fischereiwissenschaft, Hamburg).

Furthermore investigations were continued on metalloorgano complexes on marine benthic algae (Institut für Meereskunde, Kiel) effects of cadmium on growth of marine dinoflagellates (Biologische Anstalt Helgoland, Hamburg), effects of molybdane on phytoplankton (Institut für Meereskunde, Kiel), effects of heavy metals on adsorption of glycine by two species of annelids (Biologische Anstalt Helgoland, Hamburg), effects of heavy metals on population dynamics of Tisbe holothuriae (Biologische Anstalt Helgoland, Hamburg), physical chemical behaviour of transuranes and accumulation by marine invertebrates (Biologische Anstalt Helgoland, Hamburg), uptake of lead, chromium and antimony by Mytilus edulis and cadmium by Halobates (Institut für Meeresforschung, Bremerhaven), dynamics of cadmium in Mytilus edulis, pathways, uptake, storage, retention, excretion, biochemical correlates (Institut für Meereskunde, Kiel) and accumulation of heavy metals in juveniles of dab (Limanda limanda) and plaice (Pleuronectes platessa), Mytilus edulis, crustaceans (Biologische Anstalt Helgoland, Hamburg; Bundesforschungsanstalt für Fischerei, Hamburg), were investigated. The development of a sensitive bioassay using larvae of bivalves was continued (Institut für Meeresforschung, Bremerhaven).

Petroleum hydrocarbons

The uptake of petroleum hydrocarbons by maturing females of flatfishes, the transfer of the hydrocarbons into the egg and effects on the viability of embryos and larvae were tested (Institut für Meereskunde, Kiel).

Organochlorines

DDT and PCB contamination of cod from the Kiel Bight were correlated to lipid contents (Institut für Meereskunde, Kiel), of pentachlorophenol on Lanice conchilega and the fate of organic pollutants in Mytilus edulis (Institut für Meeresforschung, Bremerhaven) were investigated.

Iceland

(J. Ólafsson)

Intercalibration

An intercalibration exercise on mercury in sea water was conducted for ICES on behalf of the Oslo and Paris Commissions. A total of 37 laboratories received sample sets in this exercise and the results show evidence of significant improvements from a previous mercury intercalibration.

Metals in Mussels

Samples of caged mussels were collected at intervals through 1979 from Hvalfjörður, SW Iceland. The mussels were analyzed for Hg, Cd, Pb, Cu, Zn, Fe and Mn. The results are used for examination of seasonal variations and for comparison with results on metals in 50 samples of intertidal mussels collected at SW Iceland. In this work an emphasis has been made on using sensitive and accurate analytical methods in the determination of metal concentrations.

Ireland

(Dr. D. O'Sullivan and Dr. M.M. Parker)

A. Department of Fisheries and Forestry, Aquatic Environment Unit.

1. Fish and Shellfish Quality Monitoring.

Monitoring of the levels of six heavy metals in six species of fish and two species of commercial molluscs on a nationwide basis continues. Fish samples are taken at ports of landing in the course of other routine studies while the molluscs are collected from commercial beds.

2. Estuarine Water Quality Surveys

Five estuaries or bays on the East South and West coasts have been examined. Hydrographic parameters, primary productivity, and organic loadings have been assessed, together with heavy metal levels in seawater, sediments seaweeds and shellfish.

3. Surveys of offshore dumping sites.

Work up of data from the 1978 surveys continues. A trawling survey of fish at the south coast dumping site was undertaken and heavy metal analyses were carried out on the fish.

B. Other Research

1. Carnsore Base Line Survey

At the instigation of the Electricity Supply Board, a baseline survey is being carried out in the region of Carnsore Point, which has been chosen as a potential site for a nuclear power station. A team from University College, Dublin (Department of Zoology) are engaged in quantitative surveys of the rocky and sandy littoral, and has completed surveys of inshore plankton and young fish; Studies of records of commercial and game fish and shellfish from this area have also been completed. University College, Galway (Zoology Department) completed a survey of the offshore soft benthos and University College, Cork (Botany Department) completed a survey of littoral macro-algae.

2. Dublin Bay Study

A multi-disciplinary team from Trinity College, Dublin finished research in Dublin Bay and elsewhere on the East Coast, on the effects of pollutants, particularly heavy metals and nutrients, on the organisms and sediments, with the aim of developing criteria for the assessment of environmental quality in estuaries.

3. Cork Harbour Project

Teams from the Zoology and Botany Departments, University College, Cork, completed surveys of the benthic fauna and the benthic and littoral flora, in relation to pollution parameters in this industrialised estuary.

Netherlands

(S. J. de Groot and J. Duinker)

A study was made of the recovery of the bottom fauna in an experimental sand extraction area in the Waddensea. The recovery of the rather poor fauna in this exposed area was rapid, and took about eighteen months, although sand pits could still be distinguished.

A report was written in cooperation with the North Sea Directorate of the Ministry of Public Works and Transport - Rijswijk to evaluate the international joint study "Interaction Pipelines - Fishing Gear". These investigations were coordinated and performed at the River and Harbour Laboratory (VHL) - Trondheim/ Norway in the years 1974-1979.

The most important environmental problem for the Dutch fishery remained the presence of PCBs in especially fat fish. Cod liver determinations showed a stable high contamination of PCBs in the southern part of the North Sea. The earlier reported increase of the PCB contents in that area must be reconsidered. The number of fish in a mixed sample influences the reliability of a mean value in view of the wide variances in individual contents. In the future, mixed samples of 25 individuals will be analysed. The mean PCB values in cod livers of the last 5 years are on a product base: Northern North Sea, 2-3 mg/kg; central, 8-10 mg/kg; southern, 20-25 mg/kg. PCB problems are also present in eels from waters in direct contact with the rivers Rhine and Meuse. At least half of the PCBs occurring in the Netherlands originate from neighbour countries, but the remainder must be considered as a Dutch contribution to the PCB contamination. Eels from the river Rhine contained 10 mg/kg PCBs on a product base and eels from waters connected with these rivers showed ever higher contents: up to 20 mg/kg.

In the river Rhine HCB, HCBD and QCB are the most important contaminants besides PCBs, while their contribution in the North Sea is less important. In the North Sea the content of DDT and its metabolites are highest. The fate of dissolved and particulate suspended organochlorines during estuarine mixing was studied in the estuaries of Rhine and Meuse, and in the adjacent coastal area. Plots of salinity and dissolved concentrations of PCB, pentachlorobenzene, hexachlorobenzene, α , β- and γ-Hexachlorocyclohexane, dieldrin and endrin suggest that these compounds in solution behave conservatively during estuarine mixing and during further transport in the coastal area..

Three seals (Phoca vitulina) of the coastal waters contained in the blubber successively 120, 557 and 661 mg/kg, PCBs on a fat base. The lowest content was observed in a seal which died by drowning in the waters of Zeeland. The other seals were found dead near Ijmuiden and Ameland. It was found that organochlorines can be mobilized from female lipid tissue and deposited in lipid tissue of foetuses of a harbour porpoise. The concentration and the gas-chromatographic pattern of PCB in the foetus were not different from those in adult harbour porpoises and harbour seals from Dutch coastal waters. It was found that one of the peaks in the chromatograms is not due to heptachloroepoxide, as has been suggested by others. The fate of trace metals during estuarine mixing was studied further by analyses of manganese and its role as a key element. Organochlorines and metals were analyzed in tissue of seals stranded along the Dutch coast.

Continuous culture systems are used for the biodegradation studies with fixed residence times and constant medium composition, and organic carbon as limited growing factor. Glucose and phenol degraded completely with residence times of 1.5 and 2.5 hours respectively. 4 - chloro-phenol degraded 100% with a residence time of 40 hours and hardly any degradation was observed at 10 hours. 4-nitro-phenol did not degrade at all in 20, 40 or 80 hours. Salinity and total-phosphorus were determined in samples from the Dutch coast together with the phytoplankton monitoring programme. Concerning the control of shellfish (toxicity) no dinoflagellates were observed in Eastern Scheldt, suspected of producing toxins.

In the field of parasitological and pathological studies attention was paid to several topics of shellfish and fish research. The special guidance for oyster growers has been continued concerning the importations of seed oysters to diminish the risks of pests and diseases. Also regular checks of oyster plots in the Easterscheldt were carried out, showing that no serious pests or diseases have penetrated into the 1979 Dutch oyster culture.

Concerning fish special studies were directed to the occurrence of the fungus Ichtyophonus and the tuberculosis disease, especially in gadoids. Other problems were met with parasites in fish products and imported lots, mainly due to the occurrence of parasitic nematodes.

Norway

(P.T. Hognestad + K. Palmork)

1. Field Programmes

1.1 Chemical and hydrographic study of the Skagerrak. Observations were made through Skagerrak on the S, P, nutrient-salts, chlorophyll and trace metals. (Institute of Marine Biology and Limnology, University of Oslo).

1.2 Observations on the metal-organic complexes in the water column of the Bonnefjord with special reference to the characterisation of the complexes found in the euphotic the oxic and the anoxic layers (Institute of Marine Biology and Limnology, University of Oslo).

1.3 Trace metal species study in the Drammensfjord with particular reference to the H_2S production (Institute of Marine Biology and Limnology, University of Oslo).

1.4 Chemical changes in the sediment-water interface under oxic and anoxic conditions with special reference to C, N, trace metals and the carbonate/H_2S systems in inner Oslofjord and Drammensfjord (Institute of Marine Biology and Limnology, University of Oslo).

1.5 Investigations on the environmental qualities in the Skagerrak from Risør to Grimstad were carried out with 10 surveys throughout the year. Measurements were made of temperature, salinity, oxygen, nutrients (Biological Station Flødevigen).

1.6 Length growth of littoral fucoid algae and Mytilus edulis in relation to natural environmental factors and heavy metals (Pb, Hg and Cd) were studied (Zoological Department, University of Trondheim).

1.7 Studies of the growth rate of diatoms in situ dialysis cultures in the Trondheimsfjord. Studies on the variation in growth rate and chemical composition of diatoms as a function of nutrient supply, daylength and light intensity. (Institute of Marine Biochemistry/Biological Station, University of Trondheim).

1.8 Investigations on the environmental qualities of selected Norwegian fjords from Oslofjord to Varangerfjord were carried out during the year. The fjords were selected to represent different types of environmental conditions, fjords with expected industrial loads, domestic loads or no expected loads. Measurements were made of salinity, temperature, primary production indices, nutrients and oxygen distribution, turbidity and particulate matter. (Institute of Marine Research).

1.9 Effect of oil hydrocarbons on a shallow water sandy biotope. Field experiments are being carried out on areas of sea bed isolated for periods of time from their surroundings and subjected to addition of water containing oil hydrocarbons. Preliminary results indicate no drastic effects greater than natural seasonal variation at hydrocarbon concentrations of 25-100 ug/l. Exposures to hydrocarbons do effect physiological rates such as photosynthesis and mineralization of hydrocarbons (Institute of Marine Research).

1.10 Environmental conditions in coastal sea water. This programme continued for the fifth season. The organic load of the Baltic current is being investigated from the Øresund through the Kattegat, Skagerrak and along the western Norwegian coast. Continuous measurements are made on particulate matter, nutrients and temperature, whereas primary production indices are measured at regular intervals. (Institute of Marine Research).

1.11 Investigations of oil pollution in Norwegian waters by analysis of selected aromatic and sulfuraromatic hydrocarbons and also determination of total hydrocarbon content in cases of heavy pollution. The following projects have been operated. Monitoring of the North Sea on a section between Fedje and Shetland. Monitoring of Fensfjord which is recipient of waste water from a petroleum refinery. Petroleum hydrocarbons in sediments and benthos in the Barents Sea. Mussel watch for petroleum hydrocarbons in Byfjord, Bergen. Monitoring of controlled discharges of oily waste water from oil installations in the North Sea.(Institute of Marine Research).

1.12 Monitoring of the pelagic tar concentrations on the water off the Norwegian coast from Skagerrak to the Barents Sea. The project is a contribution to IGOSS Pilot Project on Marine Pollution (Petroleum) Monitoring under GIPME (Institute of Marine Research).

1.13 Investigations of pollution effects in coastal and fjord areas from municipal industrial effluents. The observations include standard hydrography, current measurements, nutrients, metals, halogenated and other organic micro pollutants, chlorophyll, phytoplankton, benthic algae, bottom fauna, fish and sediments according to the particular problem investigated. Analysis of metals and organic micro pollutants in organisms and sediments are carried out in cooperation with The Central Institute for Industrial Research.(The Norwegian Institute of Water Research).

1.14 The monitoring of selected fjords as a pilot project for The National Monitoring Programme of the Ministry of Environment and the monitoring of the eutrophic state of inner Oslofjord have been continued, as well as a study of the physical spreading of sewage from a deep water outlet. (The Norwegian Institute of Water Research).

2. Laboratory Assays

2.1 Specific biological programmes related to thermal effects on fish and shellfish species were carried out on mortality, growth, food uptake, hatching success and development.(Biological Station Flødevigen).

2.2 Behaviour of cod in water with gradients of the soluble fractions of Ekofisk crude oil was studied in special constructed aquariums. (Biological Station Flødevigen).

2.3 Study of effects of water with soluble fractions of crude oil was carried out on diluted natural populations of phytoplankton and in cultures of single species.(Biological Station Flødevigen).

2.4 A project on sub lethal effects of the water soluble fraction of crude oil in the flounder was carried out. (Institute of Marine Biology and Limnology, University of Oslo

2.5 Continuous bioregistrator for measuring growth rate of phytoplankton. The dialysis culture technique has been developed further, and a special continuous turbidostat has been used for measuring growth rates. This apparatus has also the possibility of measuring growth rates in the sea, and can be used in the laboratory for different algal physiological purposes. (Institute of Marine Biochemistry, University of Trondheim).

2.6 Accumulation and metabolism of phenanthrene in coalfish (Gadus virens) has been studied using carbon-14 labelled phenanthrene. It is found that carbon-14 accumulated rapidly in the liver, muscle and gallbladder.(Inst. of Marine Research

2.7 Comparative accumulation and depuration in blue mussel (Mytilus edulis) and sandmussel (Dosinia exoleta) during long time continuous exposure to different realistic levels of aromatic hydrocarbons extracted from North Sea crude oil. (Institute of Marine Research).

2.8 Routine bioassays include algal growth potential, and fish and phytoplankton tests for acute toxity. Pollution load of degradeable organics, nutrients and other pollutants has been calculated for several fjord recipients, and the effects of environmental stresses from different types of thermal power plants have been predicted.(The Norwegian Institute of Water Research).

Poland

(G. Okołotowicz)

In 1979 many Polish oceanographical studies were concentrated on pollution research of the Polish exclusive fishing zone of the Baltic Sea or on studies related to pollution.

In the chemical field determinations were made of heavy metals Hg, Cd, Cu, Pb, Zn and chlorinated hydrocarbons DDT, PCBs in water, sediments, suspended matter and biota including cod, herring, sprat, flounder, Mytilus edulis, Macoma baltica, Mesidotea entomon, Crangon crangon and zooplankton. In addition, determinations were made of salinity and concentration of petroleum hydrocarbons, oxygen, hydrogen sulphide, phosphorus, nitrogen and silica in water, and of carbon content in water, suspended matter and biota.

Biological studies were continued on primary production, chlorophyll a, phytoplankton, zooplankton, macrozoobenthos and meiobenthos.

Monitoring was carried out according to the international conventions. In addition coastal waters were monitored by the Polish water authorities.

Portugal

(C. Lima + M.E. Mergulhão)

- Étude des processus estuairiens dans l'estuaire de Sado.
  Détermination de trace de métaux dans les sédiments et matière en suspension

- Études de phytoplancton dans l'Estuaire de Tejo.
  Traitement des données des campagne antérieures.

- Caractérization (paramètres physiques, chimiques et plancton) des eaux de Madeira jusqu'à 30 milles de la côte .

- Caractérization (paramètres physiques, chimiques et plancton) des eaux cotières des Açores.

- Caractérization (paramètres physiques, chimiques et plancton) des eaux de la côte portugaise en appui à la pêche: poissons pélagiques - jusqu'à 50 milles de la côte; poissons démersaux - plateau continentale

GABINETE DA ÁREA DE SINES

Presidência do Conselho de Ministros

- Études de controle de la qualité des effluents industriels dans la zone de Sines
- Étude des paramètres physiques, chimiques et biologiques de l'eau dans la zone cotière de Sines

CENTRO DE GEOFÍSICA DAS UNIVERSIDADES DE LISBOA

GRUPO DE OCEANOGRAFIA

- Étude de la dynamique de l'Estuaire de Sado:
  - Traitement des données d'hydrologie et de currantométrie obtenues dans les campagnes de 1978.

- Établissement de cartes de courrants de heure en heure en régime de vives eaux

et de mortes eaux.

. Étude et analyse de la distribuition de la T° et de la S ‰

. Océanographie des eaux de la rive continental portugaise

. Mesures radiométriques systématiques de la distribuition de la T° de surface en mer dans les eaux cotières entre les parallèles de Lisbonne (38° 42' N) et de Vila Nova de Milfontes (37° 43' N) entre Juin et Décembre de 1979, avec l'appui de la Force Aérienne Portugaise

. Réalization par la Marine Portugaise de 6 campagnes bathythermographiques entre Septembre et Novembre de 1979 a fin de appuer les observations aériennes.

. Ces observations ont étè complementées par imagerie I.R. du satelite TIROS-N fournies par la station de réception de Dundee. (Scotland).

COMISSÃO EXECUTIVA DO POLÍGNO DE ACÚSTICA SUBMARINA DOS AÇORES

ESTADO MAIOR DA ARMADA

. Études de télèdetection d'appui à la pêche du thon dans la région de Açores.

. Tagus River Estuary, mercury pollution monitoring in water.

. Portuguese Beaches Pollution, nutrients, metals and non polar hydrocarbons in water and sediments.

. Paper mill pollution - monitoring of Celnorte paper mill effluent and coastal waters.

. Mercury pollution monitoring of Aveiro (River Vouga Estuary).
Portuguese contribution on behalf of Paris Convention

. Flores and St.Maria (Açores) - inventory of the chemical and biological parameters pertaining to the monitoring of marine pollution in areas of open sea (Water).
Portuguese contribution on behalf of Oslo Comission.

. Madeira Island - Marine pollution monitoring for the evaluation of pollution by dumping of industrial wastes in the area of Madeira from the North Europe and from the Mediterranean Sea. Portuguese contribution on behalf of Oslo Comission.

INSTITUTO NACIONAL DE SAÚDE, DR. RICARDO JORGE

. Étude de la contamination bactériologique des eaux cotières de la région de Sines.

. Étude de la contamination bactériologique des eaux de l'estuaire de TEJO dans le cadre du project "Étude Environementale de l'Estuaire du Tejo".

SERVIÇOS GEOLÓGICOS DE PORTUGAL

. Étude des sédiments mobiles de la rive continentale portugaise.

DIRECÇÃO-GERAL DE PROTECÇÃO DA PRODUÇÃO AGRÍCOLA

Divisão de Contaminação

. Monitoring of organoclorine compounds in fish from the portuguese coast. Sampling and analyses.

SERVIÇO DE ESTUDOS DO AMBIENTE

Secretaria de Estado do Ordenamento Físico, Recursos Hídricos e Ambiente

. Étude de l'impacte de la Centrale Termo-Eléctrique de Setúbal, dans l'Estuaire de Sado. Conclusion de la phase I et début de la phase II.

. Étude de l'impacte de la Centrale Termo-Eléctrique de Aveiro dans la Ria de Aveiro.
Mise au point de la méthodologie à employer.

. Estuaire de Sado: caractérization des masses d'eau, circulation, dispersion, sels nutritifs et métaux toxiques.

COMISSÃO NACIONAL DO AMBIENTE

. "Environmental study of the Tejo Estuary" in the scope of United Nations Development Programme of UNESCO, including water quality studies, fauna and flora and matematic models.
The general water quality survey plan had been redesigned in accordance with the problems due to waste discharge from existing industry, future industry and domestic sewers.

LABORATÓRIO NACIONAL DE ENGENHARIA E TECNOLOGIA INDUSTRIAL

. Controle radiologique du milieu marin. Analyses para spectrométrie γ de Aphanopus carbo et de sediments de l'Atlantic Nordeste.

SPAIN

(A. Alvarez de Meneses)

Instituto de Investigaciones Pesqueras:

1. Pollution by heavy metals and histological alterations produced in kidneys, liver and spleen of a toad fish (Halobatrachus didactylus). These experiments have been conducted by exposing individuals for forty-two days to sea water with concentrations of 0.1 and 0.01 ppm of mercury as Hg^{++} and Ch_3- Hg^{+}.
2. Researchers have been working on the white bass (Licentrachus labrax) and the gilt head bream (Sparus auratus) exposed to concentrations of 25 and 3 ppm of cadmium. The metal is found in the liver and the gut of both these species but with different rates of incorporation. Histological alterations are also found in the branchia and kidney produced by cadmium accumulation.
3. Research has also been undertaken on the influence that the accumulation of certain heavy metals (mercury and cadmium) might have on the action of the phosphatases in basic and acid media, in different organs of fishes.
4. The studies on the determination of pollution levels by hydrocarbons from petroleum in the Bay of Cadiz have been pursued.
5. Studies are being conducted on the pollution levels of organo-chlorines in marine species from littoral zones in Galicia, and on aromatic polychlorinated hydrocarbons in the marine environment, and their effects on different phytoplankton species.
6. Experiments have been focused in the appraisal of standard mixtures of PCBs as Anorclor 1232 and 1248 in the lipid composition of Thalassiosira sp.
7. The sediments of the Rias Bajas Gallegas have been sampled in the Ria de Vigo in January and August 1979.
8. The levels of PCBs, proteins, hydrocarbons, photosynthetic pigments, RNA and lipids, have been studied.

9. Studies have been made on the biokinetics of vanadium and nickel in marine organisms and sediments.
10. Analysis of pesticides and PCBs by CGL (ECD) have been done on different environmental samples, most of them sediments from the delta of rivers mainly in Cataluña.

Instituto Español de Oceanografía:

1. The work of monitoring pollution on the Spanish coast has gone on, and in certain zones, trimonthly sampling trips of ten days' length have been made. These zones are:
   - From Tarragona to Gibraltar.
   - The island of Mahon in the Baleares archipel.
   - The island of Tenerife in the Canary Islands.
   - The Mar Menor and Bay of Cartagena in the province of Murcia.
   - In Motril, province of Malaga.
   - In the rivers Piedra, Odiel and Tinto in the province of Huelva.
   - In the Ria de Vigo.
   - In the Bay of Santander.

   In addition, weekly sampling is being done in the Rias de Arosa, Muros and Pontevedra.

   In all the zones mentioned above there have been studies on:
   - Nutrients, hydrocarbons and bacteriology in the sea water.
   - Recollection of tar pellets.
   - Heavy metals and organo-chlorines in sediments and marine organisms.
2. Finally, two treaties have been agreed with UNEP:

- The MEDPOL-1 to study the dissolved hydrocarbons and the tar pellets in the Spanish Mediterranean, and
- The MEDPOL-2 which aims to study heavy metals in the same area.

We are collaborating also with FAO in the study of heavy metals in the Mediterranean Sea.

Sweden

(L. Thorell)

I. THE MARINE COASTAL ZONE - CRITERIA FOR PLANNING

1. The productivity, stress tolerance and suitability for exploitation of shallow marine areas in the Baltic, Kattegat and Skagerrak.
2. The dynamic of benthic ecosystems
Monitoring of long-term changes of the water quality in Skagerrak-Kattegat by studies on the benthic fauna in hard and soft bottoms both in deep areas and shallow coastal areas.
3. Growth and conditions for growth of fish in river mouths.
4. Nitrogen fixation in blue-green algae in brackish water.
Changes in the structure and function of the population of phytoplankton, particularly concerning nitrogen fixation, due to discharges of sewage and cooling water.
5. Regulating mechanisms and dynamic of the biological nitrogen turnover in marine sediments and bottom water.
Microbiological processes in the nitrogen cycle in oxic and anoxic sediments and bottom waters and on the effects of sedimenting heavy oils, dumping of dredge spoil and dredging.
6. Routine methods for monitoring of primary production.
The aim is to create a routine method for measurements of the primary production complex: primary production in situ, irradiance, structure and composition of the phytoplankton population, nutrients, oxygen, pH etc.
7. The production of bacteria in situ - Measurements of the production of bacteria in coastal areas in northern Sweden.
Speed limiting steps in turnover mechanisms and mineralization of organic matter in the sea. Studies of plasmid DNA as carrier of information for microbial turnover of heavy metals and persistent substances.
8. Investigation of the structure and transport of energy within the pelagic ecosystem of the Gullmarsfjord.
9. The material balance in sediments in the Baltic Sea - status and changes.
10. Investigations in the Himmerfjörd - A system-ecological analysis of the response in a recipient to the discharge of domestic sewage water.
11. Effects of discharges from pulp and paper industries.

II. CHARACTERIZATION OF INDUSTRIAL WASTE WATER

12. Ecotoxicological studies in the marine environment - Characterization of industrial waste water.
Acute lethal toxicity level, sublethal and long-term effects on growth, reproduction, fertilization and development of early stages in fish as well as bioaccumulation of pollution.

III. ENVIRONMENTAL EFFECTS OF ENERGY PRODUCTION

13. M/S "TSESIS" - distribution and long-term effects of oil in a shallow coastal area.
A study of acute and long-term effects of the M/S "TSESIS" oil spill to give a basis for future decisions on research and clean-up work.
14. Marine biological and radioecological studies in the Sound and the southern Kattegat.
Distribution and uptake by Fucus of radioactive products from a simulated discharge from the nuclear power plant in Barsebäck.

IV. FISH - METALS

15. Feeding habits of some fish species in the coastal areas in the Gulf of Bothnia. Metal uptake in food.

United Kingdom

England and Wales

(P. Wood)

Monitoring of fish and shellfish quality

Monitoring of the quality of fish and shellfish landed at ports in England and Wales has continued. As a result of earlier studies carried out over several years, recent surveys have given particular attention to resources in industrial estuaries. In addition special studies have been made in the Channel as part of the Anglo French joint investigation, and attention has been devoted to the occurrence of cadmium in edible crabs, to heavy metals in new commercial species (ling and monkfish) and to the mussel watch programme. Support has been given to the ICES programme.

Hydrocarbon studies

The baseline survey of petroleum hydrocarbons in seawater around the coasts of England and Wales has continued and some of the results have been reported to the Marine Environmental Quality Committee. Baseline data now exists for the Irish Sea, the western approaches (including post Amoco Cadiz samples), the English Channel,

the Southern Bight and central North Sea. There is some evidence to suggest that the distribution of hydrocarbons in seawater adjacent to some exploitation platforms is derived mainly from the use of oil-based drilling muds, rather than from oily-water discharges; this will be investigated further. The nature of hydrocarbons in oily-water discharges is also being investigated. A summary of PNAH compounds in a small range of selected species has suggested that a more detailed survey should be made.

Studies of the effects of a heavy oil from the Eleni V on littoral areas of the east coast have been completed. This work included study of high energy beaches and of those afforded protection; the study was continued for over one year. The acute effect of oiling was not serious and the recovery of beaches took place remarkably quickly. Although considerable quantities of oil are believed to have been retained on the sea bottom, no reports of oiling of fishing gear, or tainting of fish have been reported.

In cooperation with the British Antarctic Survey, it has been possible to determine concentrations of hydrocarbons in shellfish from sites which are unlikely to have been subjected to oil pollution. Surprisingly, values were found to be comparable with those found in benthic organisms from the central North Sea. Concentrations in shellfish from a site previously used as a whaling station were polluted to a higher level, comparable to that found in some coastal sites of England.

One laboratory in England has participated in the ICES oil intercalibration exercise. Toxicological aspects of petroleum hydrocarbons are reported in the paragraph dealing with toxicology.

Monitoring of UK waters

During the year, fisheries scientists in MAFF, jointly with their colleagues in DAFS (Scotland) took the lead in the development of comprehensive and coordingated national plans for monitoring of marine pollution around the United Kingdom. The arrangements include the coordination of government and local water authority laboratory resources to ensure that a broad range of monitoring activities are completed, although at present it has been found necessary to give priority to some studies (mainly to fish and shellfish quality and mussel watch type studies). In addition, a series of special scientific studies have been put in hand including a review of the methods of trend monitoring, the estimation of inputs of pollutants into coastal and estuarine waters, a critical review of nutrient and metal levels in seawater around the UK, an inventory of existing UK information on contaminant levels in biota and sediments, a review of hydrocarbon input studies and concentrations in the marine environment, contaminants in top predators, national intercalibration,

and research needs related to chemical speciation, and biological response. It is anticipated that these studies, to which many marine scientists contribute will be completed towards the end of 1980, and will be used as a base for an improved and expanded national monitoring programme. Current proposals have been published and are available on request.

During the year, detailed monitoring studies either at sea, or by examination of samples collected previously have been continued at several of the sites where wastes are dumped from vessels. These studies include hydrographic, water quality, sedimentological, benthic and fisheries components, and during the year reports have been published of studies off Plymouth, of solid wastes disposed off the north-east coast, and of dredge spoils. Further publications are expected soon. Some success has been achieved in the use of oyster larvae for the assay of biological water quality in coastal waters. Studies in areas subjected to sand and gravel extraction in the southern North Sea have continued.

Toxicological and related studies

The use of the Ames test for mutagenic activity has been investigated with selected wastes to determine whether it is suitable as a screening test for wastes disposed to sea. A wide range of industrial wastes were subjected to standard toxicity tests to determine their suitability for sea disposal. The seasonal variability in sensitivity of standard species (Agonus and Crangon) was determined and found to be small. The use of alternative standard species for toxicity tests (copepods and algae) has started. Comparison was made of the responses of fish, molluscs, crustacea and algae to a number of pollutants to determine their relative sensitivities. Avoidance tests using juvenile salmon were successfully carried out in the laboratory which provided information on the potential effects of an organic waste for sea disposal, on salmon migration routes. The relative toxicity of 16 oils commonly carried or exploited in the North Sea was determined. Oil dispersants have been subjected to extensive toxicological investigation.

Microbiology

Toxic dinoflagellates have been monitored by bioassay of mussels from the north-east coast of England. The blood disease of lobsters (Gaffkaemia) was diagnosed in imported shellfish during storage in England and Wales. No outbreaks in domestic stock has occurred. Studies into techniques for the purification of molluscs continue. Investigations into alternative methods for assessing bacterial contamination of molluscs are proceeding and studies on viral contamination are in progress.

Scotland

(A. D. McIntyre)

1. Shellfish and public health

A service giving advice on purification and analysis of shellfish and water for selected pollution indicators has been maintained.

2. Sewage

Research vessel cruises were made to sewage sludge dumping grounds off the east coast of Scotland. Physical and chemical observations included the collection of hydrographic data and the measurement of selected metals and organochlorines in biota and bottom sediments. Experimental studies were aimed at quantifying the effects of sewage sludge on benthos.

3. Metals

Intercalibration

The Marine Laboratory successfully participated in the ICES intercalibration exercise on mercury and cadmium in sea water, and submitted a report on the 1978/79 exercise on heavy metals in biological tissues.

Monitoring of metals in fish and shellfish

The levels of mercury were determined in monkfish, dogfish, mackerel, hake, ling, tusk, saithe, salmonids, squid, Nephrops, scallops and queens and also in selected deep water species including blue ling, redfish, halibut and some crustaceans. Arsenic was measured in plaice from certain North Sea fishing grounds.

Estuarine surveys

The concentration and distribution of trace metals in sea water, sediments and biota in the Firth of Forth was studied.

Experimental studies

The accumulation and effects of mercury on adult plaice and mussel were studied experimentally and also of cadmium in crabs.

4. Organochlorines

At the Pitlochry Laboratory, the six-monthly surveys of organochlorine residues in four commercially-exploited species of fish taken at various points around the coast of Scotland were terminated in 1978, and no samples were taken in 1979. However, in the only seriously polluted coastal area of Scotland, the Firth of Clyde, samples of herring and plaice were obtained, primarily to measure the concentrations of dieldrin and of Eulan, which is now used in place of dieldrin as a moth-proofing agent in the textile industry. Other organochlorine residues are determined routinely in the samples taken for this study.

In 1979 the dieldrin levels in the herring and plaice samples from the Firth of Clyde were similar to those of previous years. Eulan was detected in the livers of

plaice but not in herring. Concentrations of PCB, HDB, total DDT and α- and δ-HCH were similar to those of previous years.

As part of a programme to examine the influence on organochlorine levels of the recently-introduced sewage sludge dumping by Edinburgh Corporation off the Scottish east coast, samples of whiting, herring, plaice and lemon sole were taken over the dumping grounds. The levels of total HCH, HCB, dieldrin, total DDT and PCB were similar to those found in fish from the Firth of Forth in earlier surveys. Sediment samples were also taken in the spring and autumn of 1979, for comparison with earlier samples, but have not yet been analysed.

Additional mussel samples were taken from Firth of Clyde sites in 1979 for comparison with those examined as part of the 1977 mussel survey of the Scottish coast, but have not yet been analysed. A paper on the results of the 1977 survey has been prepared for publication by the Pitlochry Laboratory.

5. Oil

Monitoring

Studies of oil in selected environmental compartments have continued in collaboration with MAFF round the Scottish coast, with emphasis on selected oilfields and particular inshore areas including Sullom Voe and the Firth of Forth. Further monitoring of shellfish for oily taint has been undertaken.

Experimental studies

Large plastic enclosures at the Loch Ewe field station were again used in oil-related studies. Special attention was devoted to the effects of total effluents from offshore platforms. Other experimental studies included the effect of crude oil components on aryl hydrocarbon hydoxylase enzyme systems in cod and other gadoids, and the response of bacteria to oil in water (in the bags) and sediments (in underwater chambers).

6. Toxicity testing

A range of substances, destined for possible discharge into the sea, have been tested under laboratory conditions to evaluate their effects on the marine environment.

Northern Ireland

Studies on the effects of pollution upon the coastal waters of Northern Ireland commenced in recent years. Hydrographical and water quality investigations of Lough Foyle, River Bann Estuary, Larne Lough, Belfast Lough and

Carlingford Lough have been made by the Water Quality Branch of the Department of Commerce; other coastal waters have been investigated in relation to existing and proposed outfalls. The Fisheries Research Laboratory of the Department of Agriculture is pursuing research into the biological effects of pollution in two main areas, Lough Foyle and Belfast Lough. In the former, the chemistry and biology of the intertidal sediments is being investigated in relation to recent changes in the disposal of sewage from Londonderry. The study of Belfast Lough has examined the benthic fauna and its relation to sediment structure and chemistry, with particular reference to the presence of metals and organic matter. In addition the response to metals of a laboratory-reared stock of the marine polychaete Ophryotrocha diadema is being examined by means of factorial experiments in order to assess its ability to adapt to the metals. The levels of trace metals in shellfish have been examined sporadically since 1975 whilst samples of Mytilus have been examined for the presence of dinoflagellate toxin since 1978.

U.S.A.

(J.B. Pearce + C. Oviat)

1. Atmospheric Inputs.

There has continued to be a concern for the problems of atmospheric inputs to riverine, estuarine, and coastal environments. The U. S. Environmental Protection Agency (1979) has summarized the problems of acid rains, especially as they affect limnological processes in lakes. There is, however, little information on the immediate effects of acid rains on marine resources. Some agencies are concerned that acid rains may affect ichthyoplankton, and certain zooplankton and phytoplankton components which live or reproduce at the immediate air-water interface. Also, there is concern expressed for those anadromous species which spawn in riverine situations which might be affected by acid rains.

2. Remote Sensing.

The use of remote sensing in making long-range synoptic measurements has been expanded greatly during 1979. Johnson and Harriss (1980) have recently summarized the use of remote sensing for water quality and biological measurements in coastal waters. Their review paper indicates the potential for remote sensing

activities in assessing pollution effects over extensive areas of estuaries and the continental shelf. A joint National Marine Fisheries Service (NMFS) and National Aeronautics and Space Administration (NASA) program was conducted in April and July 1979 to measure chlorophyll standing stocks and turbidity between Cape Hatteras and the Canadian boundary. The program was called "The Large Area Marine Productivity-Pollution Experiment" (LAMPEX) and involved remote sensing by aircraft and satellites at two dozen sites along the Atlantic coast. Over 20 agencies and academic institutions were involved in collections of sea surface truth values used to calibrate the remotely sensed data. Similar remote sensing activities were planned for 1979, including the Gulf and Atlantic Survey (GAS) program which will collect remotely sensed data from the Canadian border to the Mexican boundary. This is a joint effort of the Northeast and Southeast Fisheries Centers, NMFS, and NASA.

3. Baseline Measurements and Biological Effects.

3.1 National Marine Fisheries Service.

The National Marine Fisheries Service (NMFS), Northeast Fisheries Center, has implemented a new environmental assessment and monitoring program which is initially responsible for developing baselines at stations between the Canadian border and Cape Hatteras. Once baselines have been established through the OCEAN PULSE program, these baselines are periodically monitored for changes in pollutant abundance and distribution, pollutant effects on marine biota, and movements of pollutants from terrestrial and riverine systems into estuarine and coastal systems.

The Northeast Fisheries Center of NMFS is presently developing a series of technical reports on historical environmental baselines in major estuarine and coastal waters. Reid, Frame, and Draxler (1979) have summarized the environmental baselines in Long Island Sound for the period 1972-73. These authors were concerned with temperature, salinity, nutrients, dissolved oxygen, distribution of sediment types and the distribution, abundance, and diversity of marine benthic populations.

Similar baselines in Raritan Bay were reported upon by McGrath (1974). Under funds received from the National Oceanic and Atmospheric Administration (NOAA), Sea Grant Office, and the State of New Jersey, investigators of the New Jersey Marine Sciences Consortium are upgrading and remeasuring sediments, waters, and biota at the Raritan Bay stations originally sampled by McGrath so as to upgrade the baselines in 1979-80.

Scientists at the NMFS Milford (Connecticut) Laboratory participated in four OCEAN PULSE cruises during the past year. These cruises have provided the establishment of a data bank for seasonal baseline information on the metabolism of four target species of finfish and shellfish: Cancer irroratus (rock crab), Placopecten magellanicus (sea scallop), Pseudopleuronectes americanus (winter flounder), and Scophthalmus aquosus (windowpane flounder). Also, baseline information was developed for the presence of anaerobic bacteria in sediment and water samples collected at OCEAN PULSE stations.

The NMFS, Northeast Fisheries Center, hosted a symposium on "Pollution and Physiology of Marine Organisms", with papers presented on the effects of petroleum hydrocarbons, synthetic organics and heavy metals on marine organisms and on the application of physiological monitoring techniques in field-oriented research.

Laboratory and field studies on the relationship between ecosystem and estuarine-dependent fishery productivity and effects of pollutants on this relationship continued at the NMFS Beaufort (North Carolina) Laboratory in 1979. Their studies include quantifying trophic relationships ranging from microorganisms to fish in different estuarine habitats along the Atlantic coast, as well as determining which environmental variables regulate these processes. In connection with these studies the Beaufort Laboratory is determining the biological response of different trophic levels to specific chemical forms of trace metals, particularly copper, cadmium, and zinc.

The NMFS Laboratory at Charleston (South Carolina) completed a pilot survey of shellfishes, sediments and growing waters from local (Charleston, SC) estuarine areas for heavy metals and microorganisms of environmental and public health significance and continued surveys of commercial and recreational southeast finfish species for occurrence of several trace metals. The Charleston Laboratory initiated inhouse and contract work to determine PCB's and chlorinated pesticides in fish tissues; an initial screening of chlorinated pesticides in several south Florida reef fish species was completed.

NOAA released an extensive volume entitled "Ocean Variability in the U. S. Fishery Conservation Zone, 1976". This publication contains numerous papers on salinity, dissolved oxygen, plankton blooms and other variables of interest to scientists involved with assessments of the effects of pollutants and their relationship to naturally occurring variations in populations.

3.2 U. S. Environmental Protection Agency.

The U. S. Environmental Protection Agency (USEPA) is presently sponsoring the Chesapeake Bay Program. This Program involves research being done by a number of academic and government agencies and is concerned with developing baselines for toxic wastes such as PCBs, Kepones, and metals in Chesapeake Bay. The Program is also concerned with eutrophication processes ongoing within Chesapeake Bay, as well as with establishing baselines for nutrients and phytoplankton populations. The USEPA Chesapeake Bay Program is also considering the problem of sedimentation which has increased in Chesapeake Bay with recent dredging and spoiling activities and the general industrialization of the principal riverine systems which enter into the Bay.

Along with the foregoing activities, the USEPA Chesapeake Bay Program is considering the general problem of the decline of submerged aquatic vegetation which has developed in recent years within the Bay system. The

aquatic vegetation stabilizes sediments, provides food to estuarine food webs, and serves as a principal filtering system in the Bay. There are obvious relationships between the decline of submerged vegetation and sedimentation and other processes.

The results forthcoming for the Chesapeake Bay Program have not yet been compiled as major reports or published papers. The USEPA indicates that such reports will be forthcoming in 1980.

During 1979, the USEPA Gulf Breeze Laboratory continued toxicological testing of pesticides, toxic organic compounds, and industrial effluents against a variety of estuarine and marine organisms, including algae, mysids, shrimps, and fishes; effects assessment and exposure assessment studies were performed to complete the data base on eight insecticides that require regulatory action by EPA. Such toxicological testing enables the Environmental Protection Agency to evaluate potential environmental risks of pesticides presented for registration for use in or near estuaries and to establish water quality criteria.

In a collaborative EPA-National Cancer Institute Investigation, investigators continued a survey of estuarine animals in selected estuaries and coastal regions of the southeastern United States (chiefly the Gulf of Mexico) and Oregon, attempting to correlate disease conditions with degree of pollution, particularly with specific carcinogenic pollutants that might be related to tumor prevalence or cellular disease in aquatic species. More than 30,000 fishes were examined grossly and internally for lesions and 5,000 oysters examined histologically. Fish and oyster tissues and sediment samples were collected for chemical analyses to be performed during FY 80 to isolate and identify specific carcinogenic pollutants or complexes as dictated by knowledge of pollutant sources. Among field-collected specimens were fishes with numerous tumor-like lesions with no true neoplasms yet diagnosed, two oysters with leukemia-like (blood cell proliferative) disease--one from a polluted harbor, the other from clean waters--and several clams with external growths (polyps) still to be diagnosed. Since only a portion of the specimens collected have been analyzed during the year of study, no conclusions or final correlations concerning disease prevalence and pollutant occurrence can yet be drawn. Requests for tumor-bearing specimens circulated to the public have secured several specimens with cancer-like or truly neoplastic lesions, three of which were very large, older, pond-cultured specimens of Gulf killifish, Fundulus grandis, that had large, very invasive pigment-cell tumors (erythrophoromas) on their heads and bodies. Availability of cultured Fundulus with a history of neoplasia may provide an animal model for studying certain forms of neoplasia.

A laboratory testing system ("Eco-core" testing system) has been developed that uses microorganisms in estuarine water and sediments to simulate their effects on pollutant chemicals in estuaries. Calibration of the system has been completed. The Eco-core system will be used for predicting transport and fate of toxic organic chemicals in estuarine systems to enable EPA to evaluate the potential environmental impact of these chemicals.

The EPA Bears Bluff Field Station (South Carolina), studied the toxic effects of chlorination of seawater and resultant chemical by-products continued. Oysters exposed to chlorination-produced oxidants bioconcentrated bromoform ($CHBr_3$), a byproduct of chlorinated seawater, but it was depurated within 48 hours after the oysters were transferred to clean, flowing seawater. Fouling organisms were adversely affected by chlorination: 1) barnacles are inhibited by even the lowest concentration tested; 2) mortality of oyster spat after 12 weeks exposure was from 32 to 36% at 0.000 to 0.125 mg Cl/ℓ, 80% at 0.250 to 0.500 mg Cl/ℓ, and growth was retarded at the lowest concentration tested. A method to culture mysids, Neomysis americana, in the laboratory was developed for use in life cycle toxicity tests.

3.3 States.

A number of state agencies and academic institutions have begun to compile their summary data pertaining to the water quality of regional waters. Olsen and Lee (1979), with funding from the USEPA, have compiled data on the water quality of Upper Narragansett Bay.

The State of New Jersey has developed an extensive program concerned with toxic substances which enter aquiferous and riverine systems which drain into estuaries and coastal marine waters. During recent years well waters and streams and rivers have been found to be extensively contaminated with a wide range of synthetic organic compounds known to be highly toxic to marine life. This is the first time that a major effort has been made in the northeast to inventory and develop baseline measurements for toxic substances in aquatic systems which may impact upon estuarine and marine life.

4. Monitoring.

Congress has passed new legislation (PL 95-273) which mandates that NOAA develop a federal plan for ocean pollution research, development, and monitoring, to be implemented during fiscal years 1979-83. The first product of an interagency committee on ocean pollution, research, development, and monitoring, was NOAA Working Paper No. 1, "Catalog of Federal Ocean Pollution Research, Development, and Monitoring Programs, Fiscal Years 1978-80". This paper, published in August 1979, lists 969 programs ongoing under aegis of the United States Federal Government. The document has proven to be extremely useful to scientists, legislators, managers, and concerned citizens interested in problems of marine pollution research and monitoring, since it lists most of the major research ongoing within the United States and provides a useful document for contacting principal researchers.

NOAA has mandated in 1979 that its principal programs concerned with monitoring the marine environment be integrated and coordinated effectively to produce unified monitoring programs within the various coastal regions of the United States. The first attempt to expedite this was the development of the Northeast Monitoring Program (NEMP) which includes participants from three NOAA mainline components (MLCs). The three programs to be included in the NEMP are the Ocean Pulse program of NMFS, the New York Bight monitoring program of the NOAA Office of Marine Pollution Assessment (OMPA), and the monitoring activities ongoing within the NOAA Ocean Dumping Program. The combined personnel, expertise,

and funding within these three programs will allow the development of a much more comprehensive program including many aspects of physical oceanography. The latter expertise is required in a monitoring program in order to understand the movements and fluxes of contaminants between estuarine and coastal systems.

The Interstate Sanitation Commission (1979) has issued its annual report concerned with monitoring aspects of water quality within the New York metropolitan area. The Commission consists of members from three states (New York, New Jersey, and Connecticut) which bound the New York metropolitan area. Their annual reports are used to show changes in water quality from year to year and provide important documentation for certain parameters such as BOD and coliform bacteria.

5. Long-Range Climatological Change.

It is increasingly recognized that there are interactions which occur between long-range climatological change and the introduction of pollutants to estuarine and shelf environments. In 1976 an extremely low level of dissolved oxygen affected coastal waters off New Jersey over an area covering thousands of square kilometers. A new publication has been developed jointly by the University of Rhode Island and NMFS, "Coastal Oceanography and Climatology News; Recent Events in United States Coastal Waters", which documents environmental events that are related to natural and man-induced perturbations. This journal is being sent to several hundred readers free of charge and is extremely informative in that it provides succinct descriptions of major observations and events in a timely fashion.

6. Petroleum Hydrocarbons.

Researchers from several federal and state agencies, as well as the academic community have continued to investigate the effects of the IXTOC oil spill and blowout in the Caribbean and Gulf of Mexico. During the latter part of 1979, prevailing winds carried oils away from major coastal habitats. There is, however, great concern that with a seasonal change in wind direction, the oil spill, often measurable in hundreds of square kilometers, may impact upon coastal and estuarine habitats. One of the major findings during this episode has been the observations by diver biologists that oils are broken up into small globules and droplets which remain suspended between the surface of the waters and in the benthos. Several major cruises have been involved in measuring the escape and movement of oils escaping from the blowout.

The aforementioned oil blowout has been instrumental in initiating the preparation of the final oil spill protocols and oil spill response documents in the United States. It is increasingly apparent that there is a lack of base-line information on the distribution and abundance of petroleum hydrocarbons in coastal and oceanic waters.

In 1979 final reports were forthcoming from the events which accompanied the sinking of the oil tanker, Argo Merchant. Scientists collected numerous samples of fish tissues from habitats thought to have been exposed to Argo Merchant oil, as well as from areas which were not affected by Argo Merchant oils.

An interesting finding has developed from these gas chromatographic and mass spectrophotometer analyses. This is that fish from areas not thought to be contaminated with petroleum hydrocarbons have been found to have what appeared to be elevated values for petroleum hydrocarbons. For this reason, scientists at the NMFS Northeast and Southeast Fisheries Centers have developed a joint program in which vessels will collect samples of fish tissues and sediment at a range of stations extending from the Canadian border to the Mexican boundary. These samples will be analyzed in a comprehensive fashion to determine the amounts of petroleum hydrocarbons in fish and invertebrate tissues and their benthic habitats. These analyses will provide the first comprehensive baseline for petroleum hydrocarbons in living resources along the entire eastern seaboard and the Gulf of Mexico. The first cruise involved in this study departed Woods Hole, Massachusetts, in early February 1980. This cruise is part of the Ocean Pulse program and, in addition to collecting the aforementioned samples for petroleum hydrocarbon analyses, the cruise will be collecting sea surface truth data which will be related to remotely sensed imagery collected by aircraft and satellite. Particular attention is being paid to major estuarine plumes to determine if there are significant relationships between suspended materials, frontal systems, and other variables and the levels of petroleum hydrocarbons and other toxic substances which may exist in surface waters.

The Marine Mammal Commission commissioned a review paper on the possible effects of offshore oil and gas development on marine mammals. The paper, authored by J. R. Geraci and D. J. St. Albin, University of Guelph, Ontario, presents the present status of knowledge and research recommendations on oil pollution and possible effects on marine mammals. While the paper is directed specifically towards marine mammals, there are considerable references to the effects of petroleum operations, petroleum hydrocarbons, and other phenomena associated with oil pollution on finfish resources.

Because of the Argo Merchant oil spill there has been increasing concern about understanding how oil spills are distributed and carried by physical systems. NOAA (Bishop, 1980) has recently completed a climatological oil spill planning guide for the New York Bight. This document contains information available in regard to vertical stability of water masses, monthly temperatures, wave heights, wind speeds and direction and other information of use in predicting how oil spills will be carried. The document also contains charts showing those resources and their distributions that might be affected by oil spills. This is a first in a series of guides to be published by NOAA and concerned with prevailing climatological conditions that might be important in predicting, following, and cleaning up oil spills.

Research by the USEPA, Gulf Breeze Laboratory, to determine the environmental impact of offshore oil and gas development and exploration emphasizes effects on commercially important species and corals, and is currently concentrating on studies on the Flower Garden Bank off the Texas coast and Georges Bank off the New England coast. The Flower Garden Bank,

a unique environment, is the northernmost coral reef in the Gulf of Mexico. Concern that drilling in that area could adversely affect the corals has necessitated a hazard assessment based on an exposure assessment being done by interagency agreement with NOAA and an effects determination by a multi-disciplinary team of scientists at Panama City, Florida, in a laboratory located 12 miles offshore in 110 feet of water and equipped with a running seawater system, where we have tested the effects of various drilling fluids on corals. Current research includes long-term experiments in which corals are exposed to a series of drilling fluids representative of the discharges of a well as it is drilled progressively deeper. Preliminary information on the effect of some drilling fluids on coral indicate: 1) drilling fluids adversely affect respiration; and addition of chrome-containing compounds to the drilling fluids has even greater effect; and 2) adverse feeding behavior and death result from exposure to some drilling fluids. That Georges Bank is a very productive fishing area has caused concern about the effect of pioneer drilling for oil and gas there. Here, research has emphasized determination of effects of drilling fluids on commercially important species, such as hake, lobsters, scallops, and other important food web organisms. Preliminary studies have demonstrated toxicity and lethality of some fluids to lobsters, as well as interference with their chemoreception and ability to locate food. Field validation of the lobster laboratory experiments will be conducted in summer 1980, since it is essential to test concentrations that would normally be discharged during drilling operations.

Research pursued by the Environmental Research Division of the NMFS Galveston Laboratory included an environmental assessment of an active oil field in the northwestern Gulf of Mexico, a biological/chemical survey of brine disposal sites off Louisiana, and shrimp and redfish studies relative to the Bryan Mound Brine Disposal site off Freeport, Texas.

7. Ocean Disposal of Dredging Spoils.

The U. S. Army Corps of Engineers (COE) has been conducting numerous studies of 1) the effects of ocean disposal of spoils and 2) alternatives to spoiling in the waters off the New England and Middle Atlantic coastline. One of the principal study sites is in Long Island Sound and several reports on monitoring the disposal at the Stamford-New Haven (Connecticut) spoiling site were issued in 1979 (Morton and Miller, 1980). The COE also issued a series of annual reports for disposal sites investigated as part of its Disposal Area Monitoring System (DAMOS) (Naval Underwater Systems Center, 1979 a-j). Finally, the COE released a report on preliminary evaluation of upland disposal as an alternative to ocean disposal of dredged materials from sites, often highly polluted, within the New York district (Mitre Corporation, 1980). Such alternatives are being considered because of the unacceptable levels of contaminants (PCB's, etc.) found in many riverine and estuarine habitats.

8 References

References cited in the above report are set out in document CM 1980/E: 17 (Recent publications of interest to the Marine Environmental Quality Committee).

U.S.S.R.

(N. P. Morozov)

Biochemistry of heavy metals

In 1979 All-Union Research Institute of Marine Fisheries and Oceanography (VNIRO) estimated the balance of selected metals (Fe, Mn, Zn, Cu, Co, Ni, Cr, Pb, Cd, Hg) in the Baltic Sea on the basis of publications and research on their content and distribution in biotic and abiotic components of the ecosystem. The conclusion was that the amount of metals entering the sea due to anthropogenic factors was considerable and reached Zn, Cu~34%, Ni~23%, Cr~16%, Pb~73%, Cd~31%, Hg~21% of the total output to the ecosystem. Not only industrial and city waste outflow were taken into consideration but also atmospheric precipitation as far as the burning of mineral fuel, gas-like discards of industrial enterprises in different branches of industry, transport etc, which were known to be the main source of metals arriving into the atmosphere. The concentration of metals caused by the anthropogenic factor constituted several per cent of their current content in sea water in dissolved condition (Pb~9%, Hg~4%, Cu~3.5%, Ni~3%, Cd~2.4%). There was a good correlation of these values and the data on the possible increase of the concentration of these metals in 200 m layer of the ocean due to the input from the atmosphere (Goldberg, 1972).

Laboratory research

VNIRO continued toxicologic study of the effect of a number of the surface-active substances on marine organisms of different groups (unicellular algae, primitive organisms, plankton crustacea). Conclusions on comparative toxic properties of several substances used for the elimination and limitation of oil spills were made. The elaboration and testing of marine bioassays for toxicological control of sewage was continued. Biophysical methods helped to raise the sensitivity of recording disturbances of life processes and hydrobiont behaviour in the presence of toxicants. The accumulation of heavy metals (Hg, Cd) by the developing eggs and larvae of some commercial fishes (Baltic salmon, chum, coho) was investigated. The inhibition influence of these metals on the level of some microelements (Fe, Zn, Cu) and the intensity of metabolic processes was shown. The indices of oxygen sensitivity of 30 species of marine and freshwater fishes were analysed.

INFORMATION ON SAND AND GRAVEL EXTRACTION

1979

This appendix includes returns on sand and gravel extraction during 1979 from :

Belgium

Germany, Federal Republic of

Iceland

Portugal

Sweden

United Kingdom

In addition, there are nil reports from :

Norway

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR ..1979..

COUNTRY .....Belgium.....

ISSUING AUTHORITY .....Ministry.of.Economic.Affairs.....

REPORTING PERIOD [IF DIFFERENT FROM ABOVE] .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	0.463 0.500	0.695 0.750	Kwinte Bank Goote Bank
GRAVELS	2.0 mm-6.4 cm			
PEBBLES/COBBLES	> 6.4 cm			
CALCAREOUS SHELL LITHOTHAMNION OTHER [SPECIFY]	ALL SIZES			

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

IMPACT ON FISHERIES

A CURRENT PRODUCTION Briefly specify the types of problem encountered as a result of aggregate production during the reporting period [if any]

B FUTURE PRODUCTION Detail the quantity, type and location of any proposed marine mining activity likely to be of international fisheries interest or concern

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR 1979...

COUNTRY ...Germany, Federal Republic of.....

ISSUING AUTHORITY ...Oberbergamt in Clausthal-Zellerfeld.....

REPORTING PERIOD [IF DIFFERENT FROM ABOVE] .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	0.1065		
GRAVELS	2.0 mm-6.4 cm			
PEBBLES/COBBLES	> 6.4 cm			
CALCAREOUS SHELL LITHOTHAMNION OTHER [SPECIFY]	ALL SIZES			

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MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR ..1979..

COUNTRY ....Iceland.....

ISSUING AUTHORITY ..Marine Research Institute, Reykjavik.....

REPORTING PERIOD [IF DIFFERENT FROM ABOVE] .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	0.248		Faxa Bay
GRAVELS	2.0 mm-6.4 cm	0.165		Faxa Bay
PEBBLES/COBBLES	> 6.4 cm			
CALCAREOUS SHELL LITHOTHAMNION OTHER [SPECIFY]	ALL SIZES	0.110		Faxa Bay

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

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Portugal

Rapport sur l'extraction de sable et gravier marins au Portugal

Au Portugal on extrait surtout du sable fin des côtes pour l'industrie du bâtiment.L'extraction de gravier se limite à trés peu de zones et n'est pas significative.

L'Administration Générale des Ports délivre des permis pour l'extraction de sable le long de toute la côte,sauf dans les ports de Porto,de Lisboa et dans la zone industrielle de Sines. Dans les ports de Porto et de Lisboa il s'agit surtout de dragages de vase et non de sable.

En réalité,nous savons que les quantités de sable extraites des côtes portugaises sont supérieures aux quantités autorisées. À titre indicatif,nous pouvons fournir les quantitées autorisées,pendant les dernières années:

I973 - 626 508 m^3
I974 - 598 350 "
I975 - 469 670 "
I976 - 680 545 "
I977 - 808 5I6 "
I978 - 977 I93 "
I979 - I 06I 805

Pour l'année de I980,l'Administration Portugaise ne pense autoriser que 250 000 m^3 ayant en vue l'interdiction totale dans les prochaînes années.

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR 1979

COUNTRY Sweden

ISSUING AUTHORITY Fishery Board of Sweden

REPORTING PERIOD [IF DIFFERENT FROM ABOVE] .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	69 000		Southern Sweden
GRAVELS	2.0 mm-6.4 cm			
PEBBLES/COBBLES	> 6.4 cm			
CALCAREOUS SHELL LITHOTHAMNION OTHER [SPECIFY]	ALL SIZES			

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

IMPACT ON FISHERIES

A CURRENT PRODUCTION Briefly specify the types of problem encountered as a result of aggregate production during the reporting period [if any]

B FUTURE PRODUCTION Detail the quantity, type and location of any proposed marine mining activity likely to be of international fisheries interest or concern

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR 1979...

COUNTRY England and Wales.....

ISSUING AUTHORITY ...Crown Estates Office.....

REPORTING PERIOD [IF DIFFERENT FROM ABOVE] .....

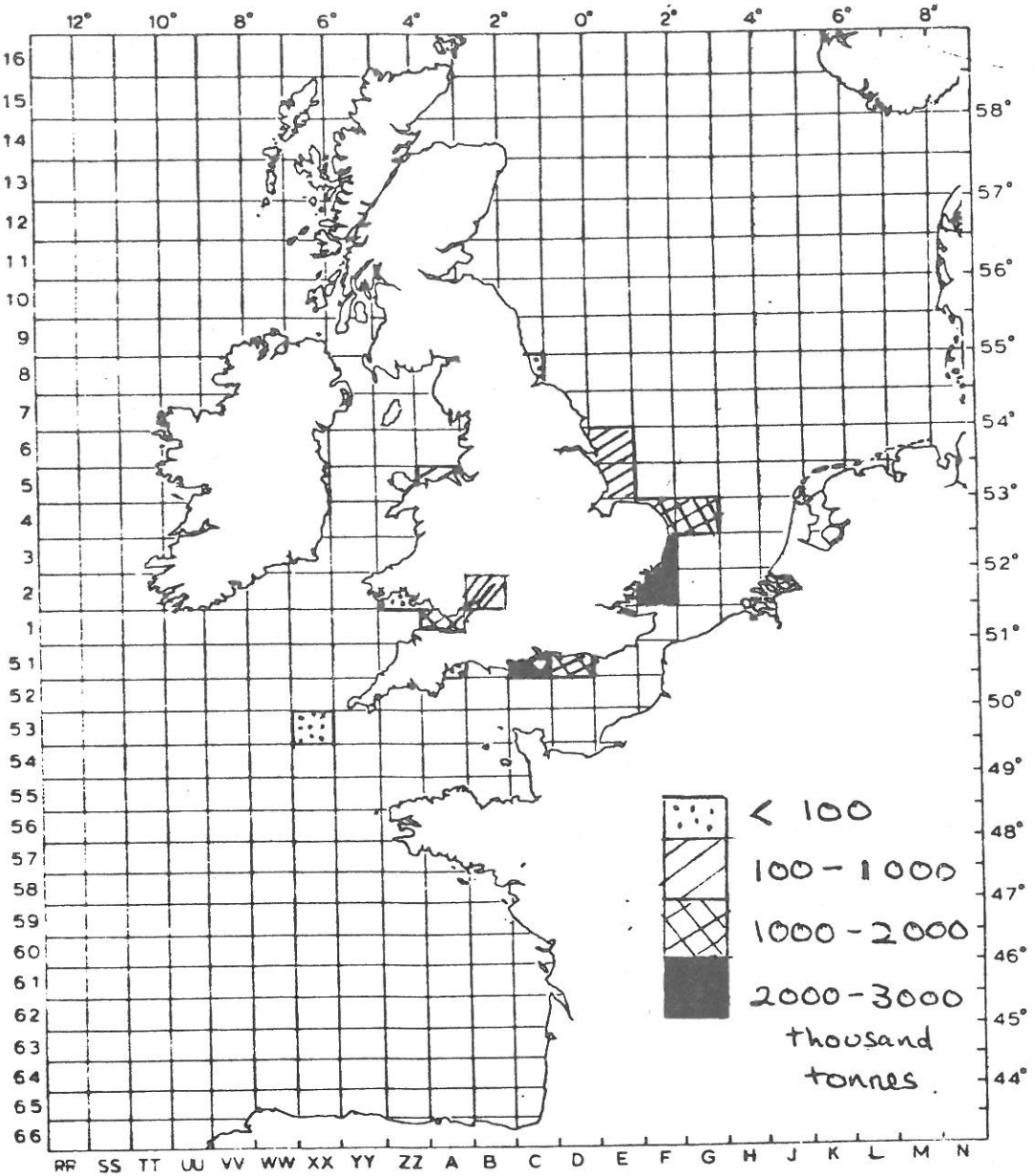
TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	11.03	16.86	A_{51} A_1 A_5 B_2 ZZ_2
GRAVELS	2.0 mm-6.4 cm			C_{51} C_8 E_5 E_6 XXX_{53}
PEBBLES/COBBLES	> 6.4 cm			F_2 F_3 F_4 G_4 D_{51}
CALCAREOUS SHELL LITHOTHAMNION OTHER [SPECIFY]	ALL SIZES		NONE	

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

IMPACT ON FISHERIES

A CURRENT PRODUCTION Briefly specify the types of problem encountered as a result of aggregate production during the reporting period [if any]

B FUTURE PRODUCTION Detail the quantity, type and location of any proposed marine mining activity likely to be of international fisheries interest or concern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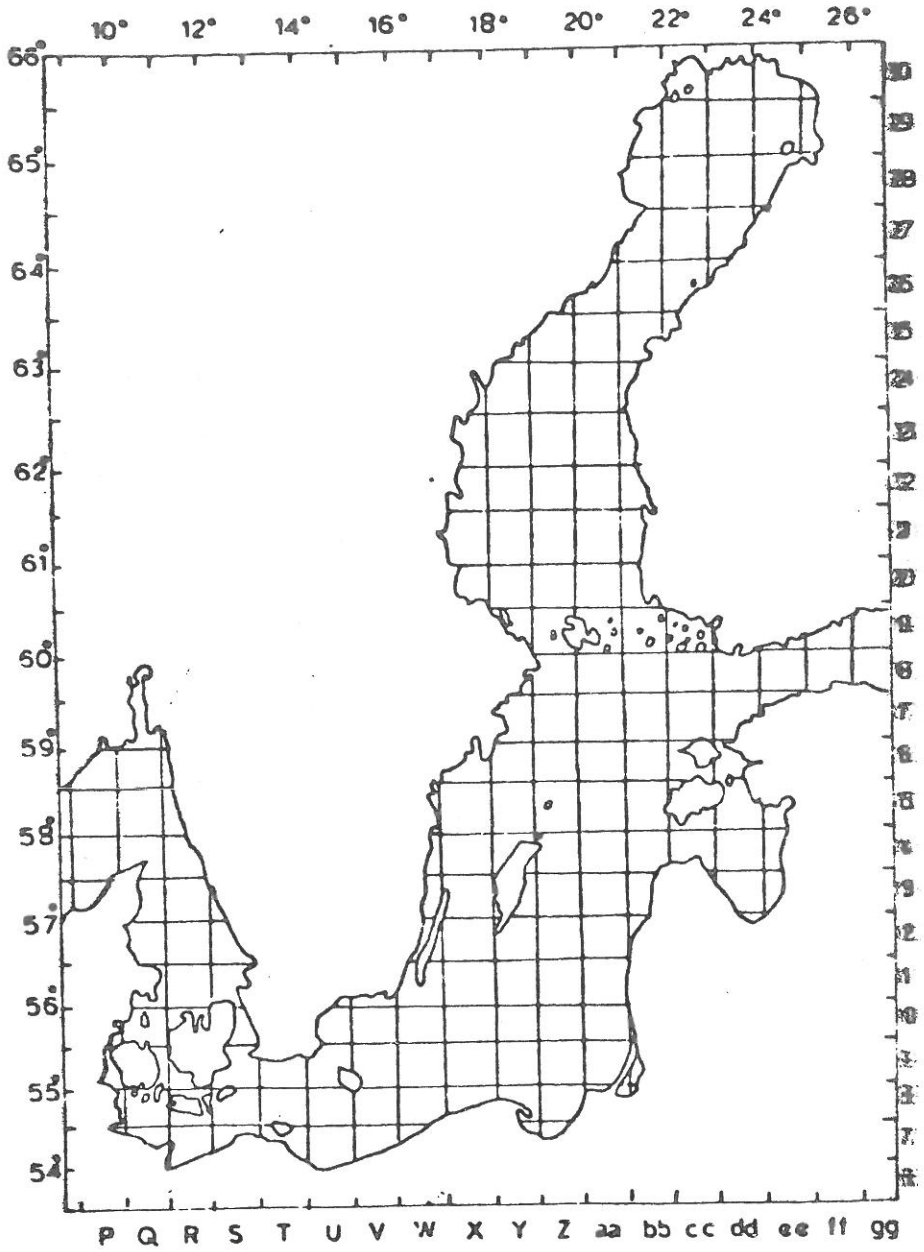
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